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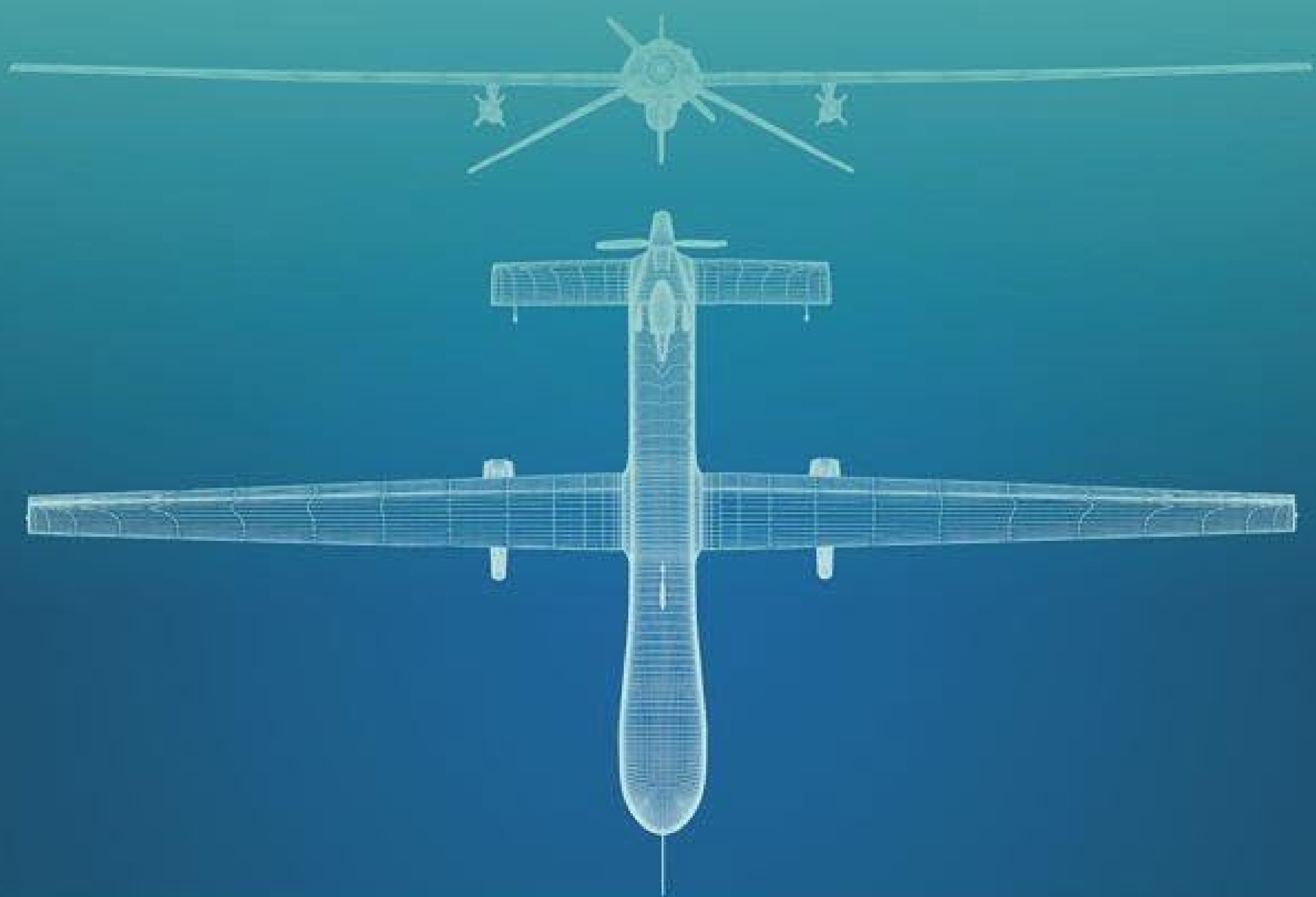
DE GRUYTER HANDBOOK OF DRONE WARFARE

Edited by James Patton Rogers



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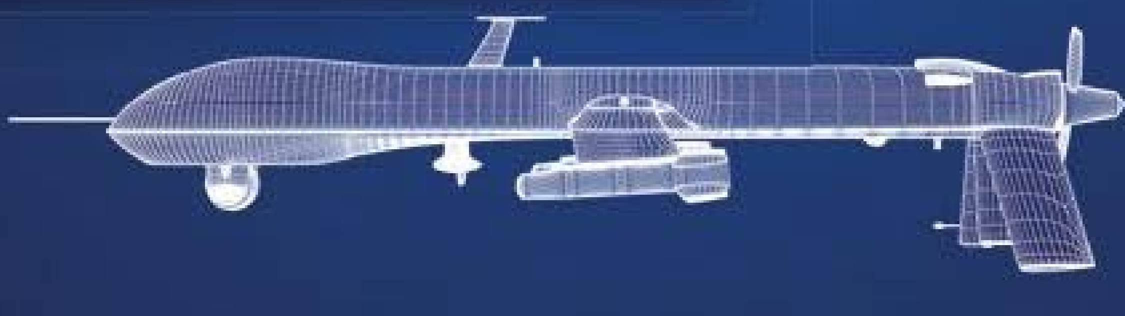

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James Patton Rogers (Ed.)

De Gruyter Handbook of Drone Warfare

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James Patton Rogers

1 Introduction: Why Study Drones?

Abstract: Why study drones? As the chapter explains, this is not only an important question, but a vital one. By outlining the different avenues of interest in drone use and the impact drones have had on the practice of war over the last 20 years, the chapter explains why it is necessary to study drones and what this analysis of drones can tell us about the past, present, and future of conflict. As the opening section of this handbook, the chapter also offers an overview of the multidisciplinary approach adopted throughout the volume, the structure of the book, the topics covered, and the high-quality analysis provided by the expert authors.

Keywords: Drones, technology, human rights, warfare, proliferation, AI, autonomy

For some the drive is technical, a chance to study and advance the latest generation of robotic systems and analyze how they merge with pioneering AI and autonomous technologies that define the fourth industrial revolution in which we live. For others, the impulse is more socially motivated, concerned about the implications of allowing drone technologies, likely in their thousands and controlled by human or machine minds, to define the smart cities of the future. For those reading this handbook, however, the reason for studying drones is likely grounded in all of the above and the history of warfare over the last twenty years. As modern drones emerged from their first armed use in 2001, they became quickly seen by the United States and select allies as a panacea to the perils of the Global War on Terror and the cost and risks of hunting down "high-profile targets" in dangerous and hard-to-reach places. During this period, human rights groups, defense intellectuals, military practitioners, and politicians all grappled with the unfolding moral, ethical, and strategic implications of dealing death from above, by remote control, and at arm's length while drone pilots sat safely thousands of miles away. Nevertheless, as these groups sought to make sense of this new drone world, such high-tech advances proved alluring to other nation-states (and non-state groups) who quickly bought, built, or borrowed drones to bolster their own military arsenals. As such, today, a varied assortment of quadcopter drones, loitering munitions, and large medium altitude long endurance systems have spread around the world, making their impact known on the battlefield and above the communities they surveil. So why should we study drones? Put simply, we are still trying to answer many of the questions raised over the last two decades, those that concern the impact and implications of the ever-expanding drone world in which we live. Why is it important that we find answers to these questions? Well, the aerial drone is just the start of an emerging world of increasingly robotic warfare across air, land, sea, space, and under the surface of the ocean, where humans are having less and less of a physical and cognitive presence in the loop of control. This makes drones

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both a pioneering and an epoch-defining weapon, a lens through which we can analyze the wars of the 2000s and the bellicose world around us, while allowing us to glimpse into the future of weapons, war, and society.

1 The Dilemmas of the Drone Age

To fully understand the impact of these remote-controlled – and increasingly autonomous – robotic systems and answer the long-standing questions about their use, we must harness a multidisciplinary mix of theoretical and conceptual approaches. The drone, after all, is a technology deployed by state militaries and non-state militants in regions of conflict, but also a "dual-use" technology that has been harnessed by multinational corporations and first responders towards the betterment of society. In addition to taking lives, it is a life-saving technology. Law enforcement, search and rescue, medics, hospitals, pharmacies, and firefighters utilize drones for surveillance, rapid response, and vital logistical/transport ends (Jackman 2022). Yet, the utility of the drone does not end there. A versatile technology, the drone has also been used as a form of protest against war, to produce art that portrays and documents the most pressing issues of our time, and as a form of remote sensing and remote vision that can help see the moment in which we live, the challenges we face, and imagine the high-tech future unfolding before us (Tuck 2018). Yet even this is not the end of the drone's utility. Truth be told, the drone, used across air, land, sea, underwater, and space, has many applications that we are not yet aware of, but when it comes to the drone as it is most commonly known – as an uncrewed aerial system (UAS) deployed in war – there are certain uses that define its place in the world (Rogers and Kunertova 2022). Intelligence gathering is one of these uses; an "eye in the sky" that can be used to document human rights abuses or perpetrate them (Holland Michel 2019). It can also be used to spy on people and gather data on high-profile individuals or groups, data which is then fed into target lists (complied by human or algorithm) that determine where future drone strikes by large Medium Altitude Long Endurance (MALE) drones or smaller loitering "suicide" systems will take place. Such strategic utility has made drones – some weighing a few pounds and others a few tons – a desirable and seemingly indispensable weapon in war. As such, the drone is many things to many people. It is an alluring, versatile, and accessible technology that promises the betterment of society on the one hand, while also being a remote weapons system that is used to surveil and kill.

It is due to these many faces of the drone that the handbook opens with a section on "Approaches to the Study of Drone Warfare." To be clear, this handbook is largely focused on the application of drone technologies in war and conflict. As such, the handbook seeks to document the ways in which the military or militant use of drones can be approached, studied, and understood both socially and militarily. From chap-

ters on "Defining Drones" (Dan Gettinger, Chapter 3), "Drones and International Law" (Amelie Theussen, Chapter 4), and "Critiquing Drone Warfare" (Amos S. Fox, Chapter 7), through to "A Gendering of Drones" (Caroline Kennedy-Pipe and Afzal Ashraf, Chapter 6), and "Drone Imaginaries" (Kathrin Maurer, Chapter 5), the opening section of this handbook provides the analytical foundations needed to understand and critique military and weaponized drones from both a traditional and critical point of view. Yet, drones also have a much longer history than the high-tech proliferated systems we see all around us today.

Weapons technologies, from the bow to the bomb, have long been instruments through which societies have enacted their political, strategic, and tactical decisions (Patton Rogers 2023). As such, the drone has not (to date) revolutionized the nature of war, but instead it has added transformative elements to the character of war. Put simply, the drone is the next step on a long evolutionary arch of human weapons development, but one that appears to stand out in war. As such, why has so much attention been paid to the drone? Why have so many studies been written on this specific weapons system over the last 20 years? Well, although interlinked with the technologies that came before it, the advent of the drone in modern warfare, at the turn of the 21st century, offered an unprecedented physical distance between the perpetrator and victim of violence. This was most evident during "The First Drone Age," a period between 2001 and 2020, where the dominant discourse around the drone was about its ability to remove American and Western-allied military forces from the frontline of battle and to hunt down those defined as terrorists.

During this period, some scholars argued that this distance made war "too easy." Here the argument was that drones made war more lethal to those on the receiving end of violence, while reducing the cost in human life to the West's best, brightest, youngest, most highly (and expensively) trained military personnel. It is for this reason that the second section of the handbook opens with an introduction to "The First Drone Age" (Sarah Kreps, Chapter 8). With chapters on "Drone Pilots" (Madeleine Rauch and Shahzad Ansari, Chapter 9), "Drones and Just War Theory" (Daniel Brunstetter, Chapter 10), "Living Under Drones" (Talat Farouk, Chapter 14), and "The CIA Drone Program" (Christopher Fuller, Chapter 11) – to name but a few – this section of the handbook explains and analyzes the post-9/11 era in which the drone really "took-off" and increasingly defined Western warfare.

Today, in the 2020s, it is hard to understand how drones were once seen as reducing the costs and risks of war. President Obama's promise that drones were part of a "just war – a war waged proportionally, in last resort, and in self-defense" may still ring true for some, but in most conflict zones around the world, the drone now symbolizes the proliferation of lethal airpower to those who have traditionally not had the means or the money to deploy death from above (Obama 2013). A weapon that empowers medium and small states – alongside non-state actors – the drone has allowed militarily weaker nations to take on great powers (or their own populations) and terrorists to quite literally transcend physical barriers that prohibited cross-border attacks (Jan-

kowicz 2023). This period of vast drone proliferation, where at least 113 nation-states and 65 non-state actors have access to drones (Rogers 2023), is known as the Second Drone Age, and thus this is what the third second of the handbook focuses on (Woods 2015). I open with a short introduction to "The Second Drone Age" (James Patton Rogers, Chapter 16), followed by some of the world's leading drone experts who offer insight into topics as diverse as "China's Drone Diplomacy" (Lukas Fiala, Chapter 19) and "Russian Military Drones" in Ukraine (Samuel Bendett, Chapter 20), through to "Drones in West Africa and the Sahel" (Olayinka Ajala, Chapter 18) and "The Islamic State Drone Program" (Emil Archambault and Yannick Veilleux-Lepage, Chapter 17). Yet, these topics outline only the start of the way drones impact and define our current and future world.

Today, drones are not just systems that are controlled remotely by humans, instead, it is the machines themselves who have a say in the decision-making – machine minds making key decisions about who lives or dies. From backroom algorithms piecing together high-value kill lists for loitering lethal drones to frontline autonomous weapons making split-second decisions about whether to take the lethal strike, the drone has ushered in a new era of distance (cognitive and physical) between powerful societies and the wars they wage. It is for this reason that we should study drones and in the final section of the handbook these concerns and visions for the future are examined. The concerns include "Autonomous Drones" (Ingvild Bode and Anna Nadibaidze, Chapter 25), "Swarming Drones" (Zachary Kallenborn, Chapter 26) and "Countering Unmanned Aircraft Systems" (Andre Haider, Chapter 27), while the visions focus on drones as "A Unique Danger to International Law" (Agnès Callamard and Carolyn Horn Chapter 29) and "Drone Proliferation and IR Theory" (J. Wesley Hutto, Chapter 30) amongst others.

By analyzing the past, present, and future of this novel weapons technology, we can begin to develop insights and solutions to future challenges as they present themselves during the Fourth Industrial Revolution of quantum, robotics, autonomous, and "AI-powered warfare" (Schmidt and Roper 2023). Indeed, this handbook is an ambitious attempt to assess the past, present, and future of drone warfare. Thirty-seven academic experts, data scientists, serving and former military personnel, historians, theorists, lawyers, human rights defenders, professors, and even a secretary-general, have come together to offer their expertise and analysis in this pursuit. To each of them I am grateful and thankful for their time and efforts. There is no doubt that the handbook is richer for each of their contributions. By no means a comprehensive analysis of the drone, or indeed drone warfare, the hope is that this book marks the start of a field of study. A way for students to learn, for policymakers to understand key technological developments and challenges, for military practitioners to understand the impact of the drone on the world, and for a field of multidisciplinary *Drone Studies* to emerge.

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Part 1: **Approaches to the Study of Drone Warfare**

James Patton Rogers

2 What Is Drone Warfare?

Abstract: At one level, 'Drone Warfare' is the deployment of drone technologies to further the political, strategic, and/or tactical ambitions of an actor in conflict. Nevertheless, with over 20 years of modern drone warfare behind us – wars that have reshaped our culture, our politics, our armed forces, and the lives of thousands – this chapter takes a deeper dive into the concept and asks "does the term drone warfare help us understand more than just the weapon itself?" By placing drones within the broader history of airpower, war, and barbarism, this chapter argues that drone warfare is indeed more than a technological trend and a novel weapon deployed in war. As an epoch-defining concept – one that captures an important moment in modern warfare – drone warfare highlights many of the novel personal, political, strategic, tactical, and technological aspects that remote-controlled and increasingly autonomous aerial systems have introduced into 21st-century conflict. In essence, although the term 'drone warfare' may fade away with the sands of time, overtaken by new trends and absorbed into the common lexicon of war, for those trying to explain how the character of war is changing across the political, strategic, tactical and personal elements of conflict, it is an important era-defining concept.[1]

Keywords: War, technology, history, airpower, drones, barbarism

For a topic so hotly debated, it is somewhat surprising how few definitions there are of drone warfare. That being said, military drone technologies, the weapons that are used in drone warfare are seemingly easier to classify. Usually characterized as Unmanned or Uncrewed Aerial Systems (UAS), drones are defined by the fact they do not have a human pilot onboard. They are controlled remotely or autonomously allowing for a level of physical distance between the human and the weapons being deployed. In addition, drones are defined by the fact they can loiter for prolonged periods over zones of conflict, that they have a sensor payload, and thus can be used for intelligence, surveillance, target acquisition, and reconnaissance (ISTAR). Not only this, but the armed variety of the drone can be used to launch an explosive payload or become a single-use weapon, fired at a target and detonated on or above the designated site of impact. Today, drone technologies range from small First Person View (FPV) quadcopters controlled via Virtual Reality (VR) headsets, to Chinese Wing Loong 3 Medium Altitude Long Endurance (MALE) systems that have a 24-meter wingspan, air-to-air missiles, and a 6,200-mile intercontinental range (Iddon 2022). Although they

1 I would like to thank Caroline Kennedy-Pipe and Tom Waldman for their input and insights during the development of this chapter, elements of which draw upon (with permission) previously unpublished work by the three of us. For more see Kennedy-Pipe, Rogers, and Waldman (2016).

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differ greatly in capacity (and size), these broad operational and technical traits remain relevant and useful when helping to define the drone and differentiate it from other weapons systems. Nevertheless, the drone is not 'drone warfare.'

A seemingly simple discussion about what encapsulates drone warfare quickly becomes entangled in a web of debates over morality, ethics, and technological transformation; debates that have been raging for over 20 years and are analyzed in depth in this volume. This being said, some scholars have tried to provide a working definition to help aid the study of the topic. Ulrike Franke, for instance, offers the introductory observation that drone warfare is "the use of unmanned aerial vehicles ('drones' in public parlance) in military operations" (Franke 2017). Such a simple definition is likely technically correct and would allow us to stop our discussion here. However, is drone warfare really that straightforward? Does the deployment of drone technologies by a military really explain the entirety of 'drone warfare,' a term that has come to epitomize the spearhead of war in the 21st century? To find out we have to step back into recent history and explore how drone warfare fits into the much longer human ambition to deploy death from above.

1 An Old Barbarism?

The ethical and moral issues involved in killing enemies is central to debates about the utility of military force. Yet, this is far from a novel controversy. Scholars as well as military and political commanders have long been preoccupied with what rules or norms govern killing. In terms of drones, the debates over targeting and killing enemies is amplified because these machines have traditionally worked with reduced risk to the crews which operate them, thus enabling states, such as the US, to intervene or execute at will. This, in many ways, seems to provide a perfect antidote to the risks and costs of war. In fact, in terms of the 20th century – a century scarred by war and conflict – the evolution of the drone seemed to provide Western states with the tool for precise as well as risk-free warfare from the air enabling political objectives to be met without causing huge losses on the other side – particularly to civilians.

In Total Wars, such as World War One and Two, norms in respect to civilians had progressively become broken or discarded as states waged wars of national survival and developed new technologies to kill more effectively if not more accurately. Airpower allowed zones of conflict to widen. Civilians, traditionally outside of declared war zones, became progressively involved and targeted by new technologies as ideas about the enemy evolved. Airpower in the period 1939–1945 created the permissive circumstances in which enemy populations could be reached and bombarded from the air, without the agony of costly land invasions (although such invasions were ultimately still required). The strategic bombing campaigns of World War Two thus set a precedent for the violation of domestic populations and the targeting of those assets

essential to breaking the war-making capacity and morale of the enemy state. Retaliation, of course, meant that the stakes for domestic populations rose as the Germans, the British, the Russians, and the Americans all competed for air superiority over Europe. George Orwell (1945) noted that precisely because of strategic bombing, war had in some respects become more democratic as lines became blurred between the war front and the so-called home front. It was not simply those in uniform (usually men) who were badged as the enemy. Strategic bombing included the targeting of women and children, as well as those laboring in factories, mines, or fields.

Engineers and inventors struggled in the era of Total War with how to make targeting more accurate or precise. Many wished to find a technical solution to end not just the slaughter on battlefields of attrition, such as in World War One and Two, but to avoid civilian death and destruction (Thornhill 2015, 5). In this respect, many American engineers, industrialists, strategists, and scientists sought to end the era of killing in mass numbers. Carl Norden, for example, focused on the technological possibilities for accurate bombing in a bid to limit collateral damage. Motivated by his religious beliefs, Norden specifically aimed to make aerial bombardment more accurate. The $1.5 billion Norden Bombsight was an ambitious project. Essentially an early analog computer, American bombardiers in crewed bomber aircraft used the sight to increase the precision of their payload (Patton Rogers 2023). By entering the airspeed, altitude, and drift of the plane, alongside other variables, the computer could calculate the exact moment at which the bombs should be released to render a direct hit on the target. Proponents claimed that the bombsight's computation ability was so accurate that it could help bombardiers "put a bomb in a pickle barrel from twenty thousand feet," or hit an apple barrel, or "the mailbox on the corner" (Singer 2009, 50). In tests the bombsight performed well, inspiring the US military to order around 90,000 units. However, in actual battle conditions, the bombsight proved inadequate. One major problem with the bombsight was that it could not perform in cloudy or smoky conditions. As an official report concluded, "cloud cover, haze, fog, smoke from fires and explosions in the target area: any of these made the optical bombsight worse than useless" (see also Lea Cate 1959). The bombsight was an intricate and sensitive computation system and it proved, at times, temperamental. Going too fast or flying too high interfered with its capabilities, so bombs would often fall notably short and wide of the designated target. Such shortfalls were obviously counterproductive for any strategic planning that relied on hitting the 'right' target. Technological shortcomings though were only in part responsible for the choices made by the Allies during the air war against both Germany and Japan. Punishment and future politics, not least the idea of future deterrence too, played a role towards the end of the conflict. Here, bombing was used to enforce the Allied demand for the 'unconditional surrender' of its enemies.

The atomic bombing of the Japanese cities of Hiroshima and Nagasaki in the summer of 1945 provided perhaps the absolute example of utilizing air power to attack a homeland and a people at no human cost to the perpetrator. (The financial cost of the

Manhattan Project was in fact enormous and may have provided at least some of the impetus to see what the investment had yielded with the use of these weapons on real people in real landscapes not just in unpopulated deserts.) These attacks took place when the United States alone possessed atomic technology, thus enabling it to freely experiment with this type of airpower without fear of a retaliatory atomic or even a conventional attack. The fact that nuclear weapons have only ever been used against a country that did not possess them was a fact that was not lost on the other great powers, least of all the Soviet Union (Alperovitz 1996). Indeed, the years following the attacks on Japan were characterized by a nuclear arms race in which states struggled to acquire nuclear power. But it was also, by the 1950s and '60s, an age in which nuclear deterrence and ideas of Mutually Assured Destruction (MAD) ensured that while the great powers refrained from engaging in direct warfare, the nascent threat to enemy civilians was omnipresent. A reversal of the norm of war took place in which the traditional notions of protecting sovereign soil yielded to the understanding (however unsatisfactory) that to destroy enemy cities – civilian population centers – could and would invite the annihilation of one's own. That uncomfortable feature of the international system did however bring help about a so-called 'long peace' (Gaddis 1987).

From 1945 to 1990 the Cold War was characterized by an absence of great power conflict in Europe. Yet, it is important to note that outside of the West the globe was marked by multiple proxy wars, civil wars, and small wars fought far away from the European theater (Mumford 2013). Inevitably because of the nature of the Cold War this often drew in and involved many smaller state and sub state groups. In fact, during this 'long peace' millions of civilians perished in these undeclared wars fought on ideological grounds – as in the Vietnam War – or in nationalist conflicts as the people struggled to overthrow colonial and imperial powers. As in Vietnam, there were many other wars in which insurgencies contained a mixture of nationalist and ideological agendas. Airpower (including thousands of early Lightening Bug drones) proved both vital and brutal in many of these conflicts, sometimes, but not always, showcasing Western technological superiority against 'inferior' enemies (Axe 2021). Here, however, we may note the dry truth that on many occasions air superiority and incredible amounts of ordnance itself failed to bring about a comprehensive victory or defeat a determined enemy. Vietnam was but one example. Still, despite failure in Indo-China, it was the Soviet Union which collapsed under the weight of the Cold War allowing its rival to proclaim a victory. Something else happened here too. With the collapse of Communism, perceptions of threat amongst liberal states were transformed from a preoccupation with the Eastern bloc, to a new sense of threat emanating from a so-called Global South. That is from a world of youthful and rapidly growing populations, part of which was proved to be prone to radical politics and assaults on Western assets. Osama bin Laden constituted a powerful if extreme illustration of a trend towards a hatred of Western ideologies, technologies, and power (Wright 2006, 4–6).

Bin Laden became a direct threat to the West after the collapse of the USSR and the end of the Soviet occupation of Afghanistan. His formation of Al-Qaeda in 1989 arose at least in part from the belief that he and his warriors had contributed to the destruction of one great power (the Soviet Union) and could just as readily defeat the other (the United States). So, fighters inspired by bin Laden (and those with their own concerns) took on US forces in Yemen in 1992, supported the anti-American mission in Somalia from 1992, and targeted US assets globally. Several bloody and audacious attacks characterized the first half of the decade including the bombing of the World Trade Center in early 1993. In 1996, bin Laden issued a fatwa declaring "war" on the United States. A second fatwa followed in 1998 in which it was proclaimed that it was the duty of all Muslims to kill both the citizens of America and those of its allies. Terrorist attacks proliferated against the United States, including the August 1998 suicide bombings against US embassies in Nairobi and in Dar es Salaam. Most dramatically, the *USS Cole* was attacked whilst in harbor in Aden (Burke 2004). This maritime assault seemed at the time to be both audacious and novel in terms of the usual strikes perpetrated by al-Qaeda.

These attacks confirmed the perception of Western states, that a geopolitical threat that emanated not from the Soviet Union but rather from a Global South conceptualized as a Middle East region yoked to the turbulent politics of North and East Africa. The end of the Cold War did not, therefore, bring about an era of sustained peace, as many had hoped, but rather heralded an age of new wars, genocide, and liberal indecision about how to manage a new and chaotic age. The 1990s were marked in some respects by the failure of the Bush and then the Clinton administration to manage this new world order. The failure of the US intervention in Somalia (in support of the 1992 UN mission) laid bare the impotence of the US despite its overwhelming military superiority to manage warlords and their associated groups in places such as the Horn of Africa (UNSC 1995). Western indecision was again highlighted during the Rwandan genocide of 1994 in which millions of people perished in violent ethnic conflicts whilst the opening stages of the Bosnian War saw again considerable timidity and hesitation over what to do and how to manage these 'New Wars' (Kaldor 1999).

2 A 'New' Barbarism?

Underneath these gloomy tendencies, however, the 1990s also brought about, for Western states, considerable advances in technological innovation. By the time the Cold War ended in 1990–91, American military technology had undergone a transformation. During the Cold War, vast investments in weapons technologies had been made by a variety of states. This was especially visible in the United States. Stephen Biddle has explained that by 1990–91 "a new generation of high-tech weapons" had

emerged and were being incorporated into the American arsenal (Biddle 1998). This became commonly known as a Revolution in Military Affairs (RMA), even though some rejected the idea of any sort of 'revolution' claiming this period to be more of an 'evolution' in military technology that could be traced to the war in Vietnam, and even the early days of American airpower.

Whatever the academic debates, the 'RMA' involved advancements in strategic thought, command, and military training. Most importantly it included huge advances in computation capabilities, data gathering and long-range information transmission, missile range and yield, as well as offensive accuracies and reliability that made new strategies possible (Iklé and Wohlstetter 1988). In combination, these achievements paved the way for a novel form of warfare, one that would be defined by the successful deployment of precision-guided missiles (PGMs) and new drone technologies (Rogers 2017).

It was from the early 2000s (after the 9/11 attacks), that these new 'revolutionary' technologies combined to allow for the drone to make its impact on modern warfare. The character of this so-called 'drone warfare' was (during this early period at least) defined by the deployment of the Predator (See Figure 2.1) and Reaper by the United States and its closest allies (such as the United Kingdom and later France).

Figure 2.1: A MQ-1 Predator, armed with AGM-114 Hellfire missiles, piloted by Lt. Col. Scott Miller on a combat mission over southern Afghanistan. US Air Force Photo / Lt. Col. Leslie Pratt. Public Domain.

In the post-9/11 world, these drones were used to 'hunt and kill' those defined as terrorists, allowing the Global War on Terror to be truly 'global.' These drones would be deployed under consecutive presidents – Bush, Obama, Trump, and Biden – as a spearhead of American force deployment in Yemen, Somalia, the Philippines, Pakistan, Syria, Iraq, Afghanistan, and Libya, amongst others. For President Obama, who galvanized the US drone program, these drones characterized "a just war – a war waged proportionally, in last resort, and in self-defense" (Obama 2013). Nevertheless, not everyone had such a clean and clear perception of the drone. Civilian casualties were documented into the thousands as the hunt for those defined as terrorists led to intelligence failures and confirmation bias. These mistakes resulted in the targeting of weddings, funerals, and individual civilians or groups mistaken as combatants (Cockburn 2015). For many, such as the Archbishop Emeritus of Cape Town, Desmond Tutu, 'drone warfare' was a dehumanizing business that could be compared to Apartheid. The US response as a society to Osama bin Laden and his followers, Tutu argued, threatened to undermine the nation's moral standards and humanity. "Do the United States and its people," he questioned, "really want to tell those of us who live in the rest of the world that our lives are not of the same value as yours?" (Tutu 2013). Drone Warfare from the 2000s was, therefore, far beyond the simple deployment of military technology in war. It was a political decision, a reflection of a society's prolonged attempt to manage a new reality shaken by the worst terrorist attacks in that nation's history, and one that did not always reflect that society's core values. Thus, for some, drone warfare was a panacea to the political and military pressures of the War on Terror, while for others it was a new barbarism.

3 Barbarism Unleashed

If drone warfare had remained similar in character to that deployed by Western states since the early 2000s, then perhaps we could come to a useful and concise definition. Drone warfare, for instance, could be the "morally contested global deployment of uncrewed aerial systems by the US and allied partners in response to the myriad threats and challenges of the Global War on Terror." Nevertheless, drone warfare, like all warfare, changes in character, and so such a definition would be over simplistic and unable to capture how the concept is continuing to evolve. Instead, today, we live in 'The Second Drone Age,' an era defined by the global spread of drone technologies to all who wish to acquire them. It is a simple fact that no weapon stays very long as the sole preserve of the nation that pioneered it. All weapons proliferate. Yet in the Second Drone Age, this has been taken to a new level (quite literally) as both hostile state and non-state actors establish their own potent air power capacity (Patton Rogers 2023, 127–144). As Orwell saw the democratization of war's brutality through airpower during World War Two, the Second Drone Age is defined by the

democratization of airpower – the means of said brutality – to a range of actors who have traditionally been unable to deploy force in the third dimension (Miles 1926). Barbarism has been unleashed.

Today, over 100 nation-states have access to military drones and at least 65 non-state actors have acquired commercial or state-supplied drone technologies (Rogers 2022). The way these drones are deployed is as diverse as the actors and technologies themselves. In fact, all types of drone, from a few inches to many meters, have made their impact known in this new proliferated drone age (see Table 2.1).

Table 2.1: Classification of UAS.

NATO UAS Classification						
Class	**Category**	**Normal Employment**	**Normal Operating Altitude**	**Normal Mission Radius**	**Primary Supported Commander**	**Example Platform**
Class III (< 600 kg)	Strike/ Combat	Strategic/ National	Up to 65,000 ft MSL	Unlimited (BLOS)	Theatre	Reaper
	HALE	Strategic/ National	Up to 65,000 ft MSL	Unlimited (BLOS)	Theatre	Global Hawk
	MALE	Operational/ Theatre	Up to 45,000 ft MSL	Unlimited (BLOS)	JTF	Heron
Class II (150 kg–600 kg)	Tactical	Tactical Formation	Up to 18,000 ft AGL	200 km (LOS)	Division, Brigade	Watchkeeper
Class I (< 150 kg)	Small (>15 kg)	Tactical Unit	Up to 5,000 ft AGL	50 km (LOS)	Battalion, Regiment	Scan Eagle
	Mini (< 15 kg)	Tactical Sub-unit (manual or hand launch)	Up to 3,000 ft AGL	Up to 25 km (LOS)	Company, Platoon, Squad	Skylark
	Micro (<66 J)	Tactical Sub-unit (manual or hand launch)	Up to 200 ft AGL	Up to 5 km (LOS)	Platoon, Squad	Black Widow

Source: (NSO, 2019).

Iran, for instance, has been developing drones since the 1980s, but chose more recently to covertly supply drone designs and technologies to a range of partners and proxies that form part of the so-called 'axis of resistance' against the West. The use of drones here is deeply political and part of a considered strategy of 'drone deniability' where a number of groups in one broad region are supplied with almost identical systems that they can deploy against US and allied targets. The fact the drones are so

similar in design and manufacture makes attribution, accountability, and concerted retaliatory action more difficult for the US and its allies. They may blame Iran but are confined in their response by the arm's length approach to drone warfare, a level of (somewhat) plausible deniability, or consideration about escalation and regional (in) stability. As such, these groups have been able to continue their attacks, mounting them with an increased ferocity and frequency against energy infrastructure, civilian industry, international shipping, the capital cities of Western allies, and US military personnel. We need only think of the targeting of international shipping moving through the Red Sea or the killing of three US military personnel by Iranian designed drones as pertinent examples of how drone warfare has been altered in terms of the political ambitions behind the use of drones and the actors/strategies used to deploy them (Keating 2024). Yet drone warfare in the mid-2020s is not just a matter of politics and strategy, it is also made up of novel tactics and technologies that help us to identify some of the varied characteristics of the concept in practice.

One of the greatest changes and challenges of the 2020s has been the use of commercial drone technologies in combat. The DJI Mavik 2 is, for instance, a relatively basic drone, yet has become a staple of both state and non-state arsenals. Launched in 2018 and produced by DJI, a Chinese technology company, this drone has a maximum speed of 72 kilometers per hour, an 8-kilometer video transmission distance, and can fly for up to 31 minutes. The practice of utilizing such widely available civilian quadcopter technologies was 'pioneered' by ISIS during the terrorist group's attempts to establish a caliphate in Iraq and Syria (Byman 2015). At first ISIS utilized the systems as an 'eye in the sky,' helping to guide vehicle-borne improvised explosive devices (VBIED) or suicide bombers towards civilians, aid workers, and Western allied targets. The common practice at this time was for anti-ISIS allies to try to shoot the drones down as a means to gather metadata that could help identify where the drone was launched. Nevertheless, ISIS quickly adapted to this in a tactically sophisticated manner by rigging their drones with explosives and turning them into a 'Trojan Horse' that when taken inside to be inspected, would explode killing and injuring troops. After this, it would not be long before ISIS tapped into the global supply chain of ever more sophisticated drones, allowing the group to mount mortar shells and grenades on their systems. Alongside the use of more powerful motors, transmitters, cameras, and thermal imaging devices, these drones could be deployed in a seemingly never-ending flow of attacks against Western and allied forces. As I discussed with Allied military officers at the time, it was becoming clear that the West and its allies had "lost tactical air superiority. We will not get air superiority in the future. We need to accept this; they will get through" (Rogers 2021). Such a warning would prove prophetic, but not entirely in the way first imagined.

Commercial drones have been used in attempted assassinations of world leaders, to smuggle contraband across borders, and by drug cartels in lethal strikes on police, lawmakers, and other criminal gangs (Chavez and Swed 2023). Yet alongside this growing and varied non-state use, commercial technologies have also become a staple

of state drone inventories. The Ukrainian military is a key example of this. From early on in Russia's offensive war against Ukraine, commercial off the shelf (COTS) drones played an important part in both offense and defense. Initially shops that sold drones to hobbyists and industry users donated their inventories to the Ukrainian military, yet once the war became a prolonged and entrenched battle, the Ukrainian government started to harness the global supply chain of available drone technologies. During the first phase of use, these drones were used in a similar way to non-state actors who acquired similar systems. As Dominika Kunertova documented, during the final months of 2022, Ukrainian drones flew "over the frontline town of Bakhmut and dropped bomblets on Russian soldiers across the battlefield. With thermal imaging cameras that enabled them to identify targets in pitch black conditions, these small drones flew unspotted" (Kunertova 2023) Yet as the war has gone on, the tactics of use, and the operators who fly drones, have changed.

Many of the drones used in Ukraine have been operated, and even weaponized, by civilian volunteers and conscripts who are able to become capable drone pilots and/or engineers with short periods of intense training (around three weeks). Due to the easy-to-use design of these commercial systems, less experienced personnel are able to deliver deadly attacks to Russian forces. Russia has carried out similar attacks and as the war has increased in intensity and scale, so too have Ukrainian and Russian drone deployments. According to journalist and drone expert, David Hambling, as of 2024, Ukraine had "more drones than soldiers in its armed forces" (Hambling 2024). To put this into numbers, according to RUSI, the British think-tank, Ukraine is losing up to 10,000 drones a month, with Russian losses also thought to be in the thousands (Reynolds and Watling 2023). Not only this, but Ukrainian president Volodymyr Zelensky promised his country would produce 'a million' drones in 2024 as part of its long sought after 'Army of Drones' (Gillett 2023). This includes the DJI Mavic family of quadcopters of which Ukraine has reportedly purchased 60 per cent of the world's global supply (Gosselin-Malo 2023). In addition, Ukraine's local manufacturing base, including civilians in their bedrooms and bakeries-turned-drone-factories, have been churning out drones in their thousands. Many of these systems vary in quality, but the most high-tech have been used in a First Person View capacity. Here a pilot straps on a Virtual Reality (VR) headset and essentially the drone's camera becomes the pilot's eyes, placing them at the frontline of battle. Diverse in age and gender, these pilots can be as young as teenagers and drawn from all walks of life (Grynszpan 2023). Yet, no matter their background, they equally face not only the relentless task of trying to find and destroy enemy targets, but also to evade being found by Russian FYP drone pilots who seek out their electronic signals or the tell-tale signs of their antenna. In fact, in many ways the drone war in Ukraine has become a new form of drone war, where bloody, muddy, entrenched frontline battles are increased in barbarism by FYP drone pilots on both sides who use their VR headsets to hunt each other down – or to strike any individual or armament they may see – in a war that is far from virtual and most certainly a brutal new reality of drone killing. Drone warfare has thus transformed in a manner that makes it, in

some ways, almost unrecognizable to the drone warfare of the 2000s and 2010s and more akin to the conventional battles of the 20th Century. Nevertheless, while some technologies and tactics have altered dramatically in the 2020s, not everything has changed.

Some state actors are happy to embrace the more ‘traditional’ tactics of drone deployment and emulate the drone strikes pioneered under consecutive US presidential administrations. Turkey, for instance, began its drone program partly in response to the fact it could not acquire drones directly from the United States due to a lack of Congressional approval. Today Turkey, especially its Baykar Defense drone manufacturer, is one of the world’s largest suppliers of drones, especially larger medium-altitude long-endurance (MALE) drones to nation states. Take the Bayraktar TB2, for example, a drone with a 12 m wingspan, 27 hours flight time and the ability to carry a 150 kg payload (Baykar 2024). This drone has become the Model-T of drones, allowing nation states with limited airpower to conduct precision strikes on their enemies. Ukraine also relied on these systems in the early days of the Russian invasion, depending on them to help hold back the Russian advance on the capital Kyiv. Ethiopia can also credit drones with the protection of their capital city and thus the maintenance of their political regime. As the *New York Times* reported in December 2021, “foreign drones tip the balance in Ethiopia’s civil war against Tigrayan forces” (Walsh 2021). In this case, drones were proclaimed to be vital to keeping Ethiopia’s embattled prime minister in power as the weapons – manufactured by China, Turkey, and Iran – were central to “reversing a rebel march on the capital that threatened to overthrow him” (Walsh 2021). As such, alongside their use in Ukraine, these versatile technologies and tactics have helped decide the fate of nations (Rogers 2023). Yet, also like during the first drone age, there have been some tragic incidents of civilian casualties that bring back the decades old fact that drone warfare can be deeply personal and indiscriminately, irreparably, destructive to the lives of innocent civilians.

Nigeria for instance, has relished the opportunity to deploy targeted strikes against its enemies and just like for the US, these strikes have garnered international condemnation and critique. In December 2023, for instance, the Nigerian Army brought the horrors of war into peaceful communities “when they conducted a military drone strike on a religious festival in the country’s Kaduna State” (Ogao 2023). In what the president called a ‘mishap,’ “civilians had gathered to observe a Muslim holiday celebrating the birthday of Prophet Muhammad” when the two sets of strikes hit the communities gathered for the religious celebration (Ogao 2023). There were 156 casualties, including children, the elderly, men, and women – families torn apart. Yet unfortunately Nigeria is not alone in these ‘mishaps.’

Between August 2023 and November 2023, no less than three drone strikes by the military of Burkina Faso resulted in civilian deaths. The strikes, reportedly undertaken by Turkish-supplied TB2s, were, according to the government, targeting Islamist fighters. Nevertheless, according to Human Rights Watch, the drone strikes actually hit “two crowded markets and a funeral” killing 60 and injuring many more (Human Rights Watch 2024). As Ilaria Allegrozzi, senior Sahel researcher at Human Rights

Watch explained, “the Burkina Faso military used one of the most accurate weapons in its arsenal to attack large groups of people, causing the loss of numerous civilian lives in violation of the laws of war” (Human Rights Watch 2024). Local testimony adds to the personal impact of these strikes. “There were hundreds of people at the market at the time of the strike,” said a 45-year-old man who witnessed the strike. “We counted 70 dead, but we only identified 28 of them. The other bodies were unrecognizable” (Human Rights Watch 2024). Such a use of drones could be termed mass killing, a form of violence that is defined by mass casualty events like these. The worrying prospect here, and one to consider for the future, is that when taken to extremes and perpetrated in a deliberate and not accidental way, drones could open the world to ‘drone genocides’ – deliberate acts of state violence against political or ethnic groups designed to terrorize and destroy a group’s way of life and very existence. The drone, after all, is a weapon of certain destruction, a precision weapon that can be used to avoid civilians or specifically to target them.

4 Defining Drone Warfare

We have covered over 80 years of history in this chapter and shed light on many of the political, strategic, tactical, technological and personal elements of drone warfare. As such, with these in mind, how should we define drone warfare? Based on the cases and the history, we can conclude that the character of drone warfare is ever changing, yet perhaps it is these five ever present key foundational elements of drone warfare that may help us to analyse, if not fully define all instances of drone warfare – past, present, and future. As such, drone warfare is:

a. Political: The choice for a state or non-state actors to deploy drones is always political. Not only have drones been used to fulfill the political promises of presidents and influence public sentiment, but as drones continue to proliferate, they have been used in novel ways to help coerce enemies and impact the relations between nations. This is unlikely to change in the years to come, making politics an integral part of drone warfare
b. Strategic: Drones are key instruments in fulfilling strategic aims in line with political ambitions. They enabled the targeted killings of terrorists as part of the Global War on Terror and continue to facilitate Iran’s strategy of ‘drone deniability.’ In fact, in some cases, drones can be perceived as a strategy in themselves, as ‘panacea weapons’ that can help fulfill political ambitions on their own.
c. Tactical: Drones are most obviously tactical weapons systems. From their deployment against energy infrastructure, civilian industry, international shipping, the capital cities of Western allies, through to the use of First Person View (FPV) capabilities on the battlefield, the tactical utility of the drone is that most documented in the history of the technology.

d. Technical: The changing character of drone warfare is linked to the politics, strategies, and tactics of any given conflict, but these are all, in their turn, influenced by the drone technologies available at the time. As this chapter has documented, over the last five years drones of all shapes and sizes have grown in technical sophistication and have become easier to use and even easier to buy. It is these high-tech innovations, from COTS to MALE drones, that have changed the way wars are being fought around the world.
e. Personal: Last, but most certainly not least, drone warfare is deeply personal, impacting the lives (and deaths) of those who live below their gaze. Yet they also impact the lives of drone pilots who closely watch the human toll of remote warfare. This human, personal toll is difficult to quantify – counting the dead isn't something the West (or any state) does well – but as this chapter has shown, more and more states are launching strikes that embroil the civilian population, destroying lives.

Of course, this is just the start of the discussion of the varied forms of drone warfare. From lethal autonomous drones to the terrorist use of commercial quadcopters, we have barely began our discussion and have so much more to cover across the 30 chapters that comprise this volume. Overall, however, it is safe to conclude that drone warfare is like all warfare. It is deeply personal in the way it impacts lives, driven by the political aspirations and edicts of elected and unelected officials, strategically minded in its approach to fulfill these political ambitions, and tactically driven with varied technical characteristics that make drones incredibly versatile systems. No matter how drone warfare changes, these five characteristics to the concept will remain, as they do in all war. And so it is through these five analytical lenses that we can define drone warfare. Drone warfare is, therefore, simply war by a prolonged name. Indeed, there can be little doubt that drone warfare as a concept may not be useful or used in 100 years' time. By then new technologies will epitomize that future moment and that future barbarism. And yet, for as long as drones are a defining feature of modern warfare, the concept is a vital analytical tool that helps politicians, policymakers, journalists, academics, and the public alike to see how war is evolving, in often troubling ways, before our eyes.

Seminar Questions

1. Is it possible to define drone warfare? If so, how would you define the concept and why?
2. What are the latest developments in drone warfare? Consider the Political, Strategic, Tactical, Technical and Personal levels of the concept.
3. What is the future of drone warfare?

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3 Defining Drones

Abstract: There are few aspects of warfare that remain untouched by the drone. In the ground, air, and maritime domains, the ubiquitous drone is challenging traditional modes of operating. Yet, as common as these weapons appear today, the emergence – and proliferation – of drones was far from guaranteed. Over the course of decades, the drone underwent a series of evolutions and experienced multiple setbacks on its path from concept to reality. This chapter explores the early history of the drone and provides a sense of the different varieties of uncrewed aircraft that exist today.

Keywords: Aerial target, aerial torpedo, remotely piloted vehicle, drone

The origins of the drone are very nearly as old as those of powered flight. During the First World War and interwar years, aircraft developers and inventors pioneered the introduction of the foundational concepts and technologies underpinning uncrewed aircraft. After the Vietnam War, which saw the first widespread use of drones in combat operations, the possibility that drones could augment or replace humans on the battlefield began to take root. Aided by the development of new materials and lightweight components, the idea of what a drone could look like and how it could perform began to change. By 1990, the contours of a diverse and multifaceted market for drones had emerged, shaping to a large extent the roles and requirements for drones on the modern battlefield. This chapter traces a few key moments in the early development of drones and identifies the types of aircraft that are in use today.

1 The Drone Takes Flight

The first flight of a remotely operated pilotless airplane is believed to have occurred in 1917. On March 17, the Aerial Target launched from a catapult located on the rear of a truck, before crashing shortly after takeoff (Everett 2015, 273). Designed at the height of the First World War by Archibald M. Low, a British Army engineer and inventor, the Aerial Target was meant to be filled with explosives and guided using radio signals towards the German defensive line or used as a defensive measure against Zeppelins (Everett 2015, 272). The British sought to conceal its true purpose from German spies by referring to the invention as the Aerial Target, though similar efforts were in fact taking place in Germany, France, and the United States (Everett 2015, 279–284).

Low's Aerial Target proved difficult to control, resulting in several crashes, and leading to the project's cancellation by the end of the war. Automatic stabilizers de-

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Figure 3.1: Winston Churchill attends a demonstration of the De Havilland Queen Bee target drone on June 6, 1941. (Credit: Imperial War Museum/Wikimedia).

signed to correct an aircraft's speed and pitch to keep it from accidentally stalling offered a potential solution to the unpredictability of pilotless planes. Variations of this technology were already in development in several countries prior to the First World War (Howard 1973, 536–537). The version that has proved most enduring is that of American inventor Elmer A. Sperry, who used gyroscopes, a device for maintaining direction and stability, and small electric motors to control the aircraft's ailerons and elevator (Hunsaker 1954).

Sperry's mechanical stabilizer served as the basis for another early pilotless airplane, known initially as the Hewitt-Sperry Automatic Aircraft and later as the Curtiss-Sperry Flying Bomb. Developed by Sperry and Peter Cooper Hewitt, his partner in the project, the aircraft used gyroscopes to maintain course and speed and a barometer to control altitude, sending the aircraft on a predetermined course before it would discharge its bombs or dive into the target. Sperry and Hewitt demonstrated the potential of this concept in a crewed flight in September 1916. The following year, the US Navy awarded the Sperry-Hewitt team a contract to convert a Curtiss N-9 seaplane into what it referred to as an aerial torpedo (Pearson 1969, 70). After a series of failed attempts in late 1917, the Flying Bomb made its first successful flight in New York on March 6, 1918 (Pearson 1969, 73).

Sperry was not the only American pursuing pilotless attack planes during the First World War. In January 1918, the US Army launched a parallel effort to that of the Navy, awarding the Dayton-Wright Airplane Company a contract for 25 Liberty Eagle aerial tor-

pedoes. The aircraft were based on a design by engineers Charles Franklin Kettering and Orville Wright. Later known as the Kettering Bug, the aircraft completed its first successful crewed flight in July 1918 and its initial, albeit brief, uncrewed flight on October 2 (Everett 2015, 258). The Kettering Bug attracted the attention of then Lt. Col. Henry "Hap" Arnold, later the commander of US Army Air Forces, who would become a vocal proponent of armed pilotless planes (Rogers 2018).

Work on both the Kettering Bug and Sperry's Flying Bomb declined following the end of the First World War – in 1921, the Navy decided against acquiring Sperry's aircraft (Pearson 1969, 73). Beginning in 1922, however, Carlos B. Mirick, an engineer at the newly established Naval Research Laboratory (NRL) in Washington, DC, would apply Sperry's invention to a new iteration of the pilotless plane, one that would benefit from both the automatic stabilizer and radio controls. Mirick used Sperry's Curtiss N-9 seaplane, which was already fitted with gyrostabilized controls, as a platform for testing the radio link, receiver, and relay equipment (Callahan 2014, 102).

Under the direction of Albert Hoyt Taylor, who was later credited with the invention of radar, Mirick and the NRL conducted several test flights of a crewed, ground-controlled airplane – the "Wild Goose" – in the summer of 1924, before making the first fully uncrewed flight on September 15, 1924 (Mirick 1946). The flight was a near-total success until one of the seaplane's pontoons collapsed during the landing, submerging the aircraft in the Potomac River. Still, Mirick's September flight has been credited as the first instance in which an uncrewed, remotely controlled aircraft successfully completed a takeoff, airborne maneuver, and landing (Fahrney 1957, 167). The project continued for another year, before the Navy cancelled it in 1925.

Progress on radio-controlled aircraft in the US stalled in the late 1920s, shifting attention to the UK. In 1930, the Royal Aircraft Establishment began exploring the conversion of crewed aircraft into uncrewed target planes for anti-aircraft gunnery practice. The initial model, the De Havilland Fairey Queen, made its first uncrewed flight in 1932 (BAE Systems 2022). Its successor, the De Havilland Queen Bee, featured a more sophisticated radio datalink than older pilotless planes and communicated the aircraft's altitude to the operator. In the years after its first flight in 1935, around 400 Queen Bees were delivered to the British military (BAE Systems 2022).

The Queen Bee appears to have inspired the first usage of the word "drone" in connection with pilotless planes (see Figure 3.1). After learning of the Queen Bee during a visit to the UK in early 1936, US Chief of Naval Operations Admiral W.H. Standley pressed the Navy to develop uncrewed target planes to improve the proficiency of naval anti-aircraft gunners (Fahrney 1957, 190). That year, the Naval Aircraft Factory in Philadelphia launched Special Project D, or Dog, under the direction of Lt. Cdr. Delmer S. Fahrney to develop the target planes. The NRL was tasked with improving the radio communications and control of the aircraft (Gebhard 1979, 227).

In his account of the origins of the program, Fahrney writes that the name "drone" was derived from a conversation in November 1936 between him and Albert Hoyt Taylor, then the technical director of NRL, regarding a codeword for the Navy

project (Fahrney 1957, 200). According to Fahrney, after considering other insect names as codewords, the two settled on the word drone because it best described the missions in which the aircraft would be used, and because the word was "easy to handle" (Fahrney 1957, 201). Taylor, meanwhile, credits himself for first calling the aircraft drones. "To those who know anything about honeybees, the significance of the term will be clear," reflected Taylor in 1948. "The drone has one happy flight and then dies" (Taylor 1948, 96).

Taylor and Fahrney thought the term embodied the expendability and specialization of the pilotless plane. In the hierarchy of a beehive, the drone is a male bee whose sole role is to mate with a queen midflight, before expiring shortly thereafter. Like the doomed male bee, the Navy's pilotless planes were optimized for a singular purpose, at the end of which lay destruction. Fahrney's reasoning for using the word drone to describe pilotless planes further alludes to the staying power of the term and its continued popularity. The name drone was "used in all discussions" to describe the aircraft, recalls Fahrney, who eschewed a more technical term in favor of one that could be readily applied to convey the essential characteristics of the aircraft (Fahrney 1957, 201).

Indeed, although the Fahrney and Taylor conceived of the term as a codeword for the target drone project, Fahrney later appropriated it to identify other pilotless planes. These included the Navy's TDR-1 and TDN-1 Assault Drones during the Second World War, a follow-on program from the target drone project. The Second World War saw the introduction of television guidance for attack drones, which the NRL developed to enable an operator to control the aircraft beyond their visual line of sight (Gebhard 1979, 229). It also saw the first, albeit limited, offensive uses of drones in wartime, including a strike by the US Navy's TDR-1 drones in the Solomon Islands (Lerner 2017). In the years after 1945, drones began to assume additional duties, serving as vehicles for collecting data from nuclear tests and, later, as platforms for collecting intelligence.

2 The Evolution of the Drone

A short blurb in the April 2, 1965, edition of the *New York Times* announced that the Chinese government had publicly displayed what it said was a downed American spy drone in central Beijing (New York Times 1965). The reconnaissance drone, which had been shot down over south-central China, was one of several claimed by Beijing in the preceding months. The US decision to send spy drones over China was a deliberate choice by Washington to avoid the geopolitical wrangling that occurred after the Soviet Union downed US Air Force U-2 pilot Francis Gary Powers over its territory in 1960 (Erhard 2011, 6).

Figure 3.2: A Ryan Aeronautical Model 147 “Lightning Bug.” (Credit: US Air Force/Wikimedia).

The reconnaissance drone represented an evolution in thinking about uncrewed aircraft, one that propelled the drone away from its origins as a target plane and rudimentary missile and into a more active role in military operations. In 1960, the US Air Force awarded Ryan Aeronautical a contract to convert its jet-powered drones from aerial targets into reconnaissance platforms (Clark 2000, 13). Following the 1962 Cuban Missile Crisis, Big Safari, an Air Force research and procurement program, continued this work with fresh urgency, resulting in the development of the Model 147 Lightning Bug (see Figure 3.2), a converted Ryan Aeronautical Firebee target drone (Erhard 2011, 7).

After first deploying the Lightning Bugs to Vietnam in 1964, the US Air Force conducted more than 3,500 sorties involving 1,000 drones over the course of the war, marking the first large scale use of drones in combat operations (Clark 2000, 14). The Air Force continued to modify the Lightning Bugs, producing variants designed for collecting electronic and communications intelligence in addition to those intended for photographic reconnaissance (Clark 2000, 16). One such version, the Model 147E, was able to detect an incoming anti-aircraft missile, technology that was later integrated into radar early warning systems for fighter aircraft (Axe 2021). Other variants for jamming adversary radar sites and dispersing propaganda leaflets also saw limited use.

In the early 1970s, the Air Force began to study the possibility of using the drones to attack ground targets. It awarded Teledyne Ryan a contract to arm versions of the Firebees with a variety of munitions, including the Maverick air-to-ground and Shrike antiradiation missiles. In a test on December 14, 1971, a BQM-34A, a version of the Ryan Aeronautical Model 247, launched a Maverick at a simulated surface-to-air missile site, perhaps the first instance of drone-launched missile (Clark 2000, 23). Around the same time, the Navy staged a mock dogfight in which a remotely controlled drone successfully scored several simulated hits on a crewed fighter plane (Aviation Week

1971). The Air Force and DARPA continued to develop a multipurpose armed drone in the model of the Firebee, before abandoning the project in the late 1970s.

Despite their widespread use by the Air Force for reconnaissance and intelligence-gathering in Vietnam, the modified target drones had several drawbacks that limited their appeal for other types of missions. The jet-powered Lightning Bugs flew at high speeds and according to a preprogrammed route to avoid interference from adversary anti-aircraft fire and jamming, making these aircraft better suited for reconnoitering fixed sites than for surveilling mobile targets. The Lightning Bugs, each of which could weigh over 350 pounds (150 kilograms) depending on the mission equipment, were also resource intensive to operate. A squadron of Lightning Bugs required hundreds of personnel and more than a dozen crewed airplanes and helicopters to launch and recover the drones, making each mission a costly and complex endeavor (Hall 1978, 20).

Within the Pentagon, momentum was building towards developing a lightweight reconnaissance and targeting drone with fewer infrastructure demands, one that could accompany soldiers to the frontline of the battlefield. Beginning in the late 1950s and throughout the 1960s, multiple efforts in the US and worldwide sought to develop tactical drones that could fulfill this mission. These efforts resulted in drones like the US Army's short-lived Radioplane AN/USD-1 and the Marine Corps' Bikini Surveillance System, as well as the West German Dornier Kiebitz tethered drone. Yet, although some of these drones, like the Canadian CL-89, were successfully adopted in later years, most were deemed unreliable and unsuited for the mission requirements (ARPA 1972, 8).

In 1972, the US Advanced Research Projects Agency (ARPA), or DARPA as it is known today, launched a program to develop miniature drones using off-the-shelf technology (Hirschberg 2010, 5). The program was encouraged by Dr. John S. Foster, then the director of Defense Research and Engineering at the US Department of Defense (Reed, Van Atta, and Deitchman 1990, 285). Foster, an avid model airplane hobbyist, believed that the simplicity and low cost of hobby aircraft offered an example that could be replicated in military drones (Klaas 1973, 76). The ARPA Mini-Remotely Piloted Vehicle (Mini-RPV) program, initially a collaboration with the US Air Force, aimed to develop a drone that weighed under 70 pounds (32 kilograms) and cost less than $10,000 a copy to produce (Reed, Van Atta, and Deitchman 1990, 286).

The ARPA Mini-RPV program produced two initial drones – the Praeirie, which included a television sensor and laser designator intended for daytime use, and the Calere, which used an infrared sensor for nighttime operations (Hirschberg 2010, 6). Both aircraft drew heavily on model aircraft designs and, to minimize cost, used commercially available components such as lawnmower engines and off-the-shelf datalinks (Reed, Van Atta, and Deitchman 1990, 285). "[W]hen we think about RPV technology, we think technologically something scaled up from model airplane technology rather than scaled down from manned aircraft technology," wrote David A. Heebner, then the deputy director of Defense Research and Engineering, in a 1975 editorial (Heebner 1975, 3).

The ARPA program, which ran until 1976, inspired wide interest in the aerospace industry and resulted in the development of a panoply of competing mini-drone designs. The program led to advancements in lightweight sensors like Philco-Ford's 1974-era forward looking infrared (FLIR) sensor (Aviation Week 1974). The introduction of lithium battery-powered electric motors, a hallmark of drone aircraft today, was another consequence of this program (Aviation Week 1973).

Successive versions of the Praeirie and Calere would serve as the basis for follow-on programs within the Air Force, Army, and Navy (Miller 1974). The largest of these was the Army's Aquila program, which ran intermittently between 1974 to 1987. Under the Aquila program, the Army sought to develop a tactical drone to conduct day and night battlefield reconnaissance and identify targets for field artillery. The Army's Aquila program was closely related to its development of the Copperhead guided artillery munition, which could be guided to targets by a laser designator on a spotter plane or drone. With the assistance of the Aquila, the Army believed it could substantially increase the range of artillery fire to attack targets far beyond the line of sight (Dastrup 2018, 123).

After multiple iterations, the Aquila ballooned in cost and failed to satisfy one of the Army's key requirements – that of a drone capable of detecting and tracking moving targets such as tanks (GAO 1987, 18). The Army encountered difficulty in developing protected communication datalinks that could resist jamming from adversaries while delivering consistent video imagery of the battlefield. Other challenges with the sensors and avionics contributed to the growing cost of the aircraft, with each unit estimated at around $900,000 apiece (GAO 1987, 2). The total development cost of the Aquila program is believed to have surpassed $1 billion, far more than the $123 million initially budgeted (GAO 1997, 2).

The original ARPA program and the Army's Aquila drone presented competing visions for what a tactical, battlefield drone could look like, underscoring an essential tension in the development of military drones that persists to this day. John Foster and ARPA conceived of a simple, low-cost drone that could capitalize on advances in commercial off-the-shelf technology. The Army, meanwhile, sought to develop a hardened, jam-resistant drone capable of operating in contested battlespaces. Both concepts would seem to be validated by the American experiences in the 1990–1991 Gulf War (Aviation Week 1991), and both would find a prominent place in future battlefields.

However, the US military's failure to produce an operational drone prompted lawmakers in Congress to mandate the creation of a new office within the Department of Defense – the Unmanned Aerial Vehicle (UAV) Joint Program Office (JPO) – to handle drone development and acquisition programs (Canan 1988, 84). To coordinate the disparate Army, Air Force, and Navy programs and create common requirements for the services, the newly formed UAV JPO published the Pentagon's first master plan for nonlethal drones in 1988 (Greeley 1988). The plan defined requirements for four categories – close range, short range, medium range, and endurance – of nonlethal drones, formalizing the need for a spectrum of operational capabilities.

The UAV JPO plan reflected the changes underway in the drone marketplace. In the roughly two decades since the deployment of the Lightning Bugs to Vietnam, a diverse array of drone types and capabilities had displaced the jet-powered target drone as the driving force in drone design and development. By the late 1980s, the number of drone systems in use or testing had grown from around 30 in 1965 (Jane's 1965) to over 200 in 1988 (Munson 1988, 7). Some of these aircraft had already proven their usefulness in combat, most notably in the 1982 Lebanon War (Kreis 1990, 46). So much so that a 1986 assessment by the US Central Intelligence Agency warned that "inexpensive and easy-to-use" drones could proliferate to militaries worldwide (CIA 1986, 3). The conditions for a new era of drones, one defined by the ubiquity and diversity of these aircraft, were coming into focus.

3 The Types and Origins of Drones

Figure 3.3: The Lockheed MQM-105 Aquila. (Credit: US Army/Wikimedia).

In the early years of aircraft development, drones like the Curtiss-Sperry Flying Bomb and De Havilland Queen Bee were largely uncrewed versions of piloted airplanes that were modified to fly without humans onboard. Gradually, in the 1970s and 1980s, advances in composite materials, low-cost engines, and miniature sensors enabled drone developers to explore more imaginative airframe configurations (see Figure 3.3). Today, drones encompass an enormous variety of sizes and designs ranging from palm-sized helicopters to those with the wingspan of a commercial airliner.

Like any aircraft, drones conform to a few overarching categories of heavier-than-air vehicles. A fixed-wing aircraft is one in which the wings generate lift, while a rotary-wing aircraft uses rotors to achieve the same effect. A vertical takeoff and landing (VTOL) aircraft uses propulsors to takeoff and landing vertically, and wings for forward

flight. Each category includes multiple varieties designed to maximize effects like reducing drag or improving stability. Though it is far from an exhaustive list, the following represents a few of the most prominent configurations for uncrewed aircraft.

Conventional fixed-wing drones feature distinctive fuselage, wing, and tail elements. Like gliders, conventional fixed-wing drones typically have high aspect ratio wings, meaning that they are best suited for flying for long periods. Developed in the early 1970s, one of the earliest high-altitude long-endurance drones, the E-Systems L450F, was an uncrewed version of a glider, the Schweizer SGS 2-32 sailplane (Parsch 2002). In designing the 1980s-era Leading Systems Albatross, the predecessor to the Predator drone, Abraham Karem sought to build a drone that could fly for days at a time (Whittle 2014, 27). The long flight time of conventional fixed-wing drones is one reason why this remains a common design for uncrewed aircraft.

A common distinguishing factor of conventional fixed-wing drones is the tail, of which there are several varieties. A few of the earliest operational drones, the Second World War-era TDR-1 Assault Drone and Radioplane OQ-2 Target Drone, featured the inverted T-tail, or conventional tail. In the early 1960s, the French Aerospatiale CT.20 target drone and R.20 reconnaissance drone adopted a V-tail, or butterfly tail. Although uncommon for crewed aircraft, the V-tail is today widely used by a variety of drones, perhaps most notably by the General Atomics MQ-9 Reaper. Other tail designs include the inverted V-tail, evident on the Predator, and the T-tail, which has been adopted by aircraft like the Safran Patroller, Eurodrone, and CASC CH-6.

Twin-boom drones are a type of fixed-wing aircraft that feature two tubular, parallel booms extending rearwards from either the wing or the fuselage to the tail. The twin-booms can reduce the aircraft's overall weight and drag and improve stability. A few if the first twin-boom drones emerged in the US in the early 1970s; drones like the Lockheed RTV-2 were designed for DARPA and other defense programs (Munson 1988, 164). Of all the drones that emerged from this period, however, the twin-boom Israel Aerospace Industries (IAI) Scout is the most enduring. Developed in the late 1970s, the Scout is the predecessor to the IAI Searcher, a widely exported drone (Gettinger 2019), and the US RQ-2 Pioneer, which was the basis for the US Army's long-serving AAI RQ-7 Shadow.

As with conventional drones, twin-boom drones have a variety of different tail types. In the case of the IAI Scout, the twin booms connect to two vertical stabilizers situated on each end of horizontal stabilizer, a design known as the H-tail. The AAI RQ-7 Shadow and Baykar Bayraktar-TB2, meanwhile, features two twin booms that extend to an inverted V-tail. In some cases, the two twin booms may support additional engines. The Tengden TB-001, TW-328, features a twin-boom, twin-engine design in which the two engines are located at the forward end of the two booms. The Textron Aerosonde HQ features two booms that extend forward and rearwards from the wing, each supporting two motors that allow the aircraft to take off and land vertically.

Flying wing, blended wing-body, and delta wing designs can be visually similar, with each often featuring a triangular airframe with swept-back wings. Even if

these terms are at times used interchangeably, there are differences between the three designs. A flying wing drone is a type of tailless aircraft in which there is no visible difference between the fuselage and the wings, while the fuselage and wings on a blended wing-body and delta wing are visibly separate structures. Each of these configurations may appeal to drone manufacturers for their design simplicity, durability, and efficiency in flight. Flying wing and blended wing-body configurations can also be designed to have a low radar signature, making them harder to detect than conventional aircraft.

In 1973, shortly after launching the Mini-RPV program, DARPA provided Teledyne Ryan with funding to build a flying wing drone known as the Manta Ray for the US Navy's Shipborne Tactical Airborne RPV (STAR) program (Hirschberg 2010, 6). In the mid-1970s, Northrop proposed a flying wing design for the US Army's Aquila program, though the winning design was Lockheed's delta wing configuration (Aviation Week 1973). Beginning in the early 1990s, the US Defense Department pursued the development of a large, stealthy drone in a flying wing configuration that could elude hostile air defenses (Aviation Week 1994). Nearly two decades later, the US Navy's Northrop Grumman X-47B demonstrator strike drone, a future iteration of this concept, featured a blended wing-body design.

Multiple large drones like the X-47B that feature the flying or blended wing-body configurations are in development. These include China's CASIC Caihong-7 and CASIC Tian Ying, Russia's Sukhoi S-70 Okhotnik, and South Korea's KAI K-UCAV. However, among the drones that are in use today, these configurations are more commonly found in smaller and mid-sized drones, particularly hobby drones and loitering munitions – single use armed drones. Drones like the Skywalker X8 that are popular among recreational users have also been used in multiple armed conflicts, most notably in Iraq and Syria in the mid-2010s (Gettinger 2016, 5). Loitering munitions with a delta wing design such as the Iranian HESA Shahed-136 and Israeli IAI Harpy have been used widely in multiple armed conflicts (Binnie 2021).

A **tandem wing** configuration is a fixed-wing aircraft with two main wings, or two pairs. Typically, these wings are aligned in parallel, with one behind the other, though in some cases the wings may be joined, forming a diamond-like shape. The tandem wing configuration is favored for its high lift-to-drag ratio, allowing the aircraft to fly longer distances using less power, as well as its stability and portability. In some cases, the wings are designed to be folded for storage and transportation, before extending after the aircraft is launched. Today, tandem wing drones are typically small, lightweight aircraft designed to be launched from a tube carried in a backpack by an infantry soldier. A handful of larger drones, such as China's WZ-7 Soaring Dragon, have also adopted the tandem wing configuration.

Most **helicopter** drones feature a single main rotor and tail rotor, though some have tandem or intermeshing rotors. The concept for uncrewed helicopters emerged in the 1950s, when the US Marine Corps began exploring the idea of "robot" helicopters for cargo delivery and commissioned tests of the Kaman HTK-1 Drone, an uncrewed

version of the HOK-1 helicopter (Rawlins 1976, 92). Although that plan never materialized, the Marine Corps would use the Kaman K-MAX to deliver supplies to forward operating bases in Afghanistan 60 years later (Davies 2014). Today, single-rotor drones are typically midsized and large aircraft, some of which, like the Northrop Grumman MQ-8 Fire Scout and Airbus VSR700, are derived from the airframes of crewed helicopters. Given their small footprint, these drones have been widely adopted by navies for maritime use, an environment in which storage capacity and landing areas are limited. A handful of miniature helicopter drones, like the tiny FLIR Black Hornet, are also in operation with ground forces.

Coaxial helicopters feature a pair of rotors, with one mounted above the other, potentially offering improved stability and safety over rotorcraft with one main rotor. In the 1960s, coaxial rotorcraft, particularly when tethered to the ground, were viewed as a possible alternative to miniature fixed-wing drones because of their lower support requirements. A few of the first coaxial rotorcraft developed during this period included the Gyrodyne Drone Anti-Submarine Helicopter (DASH), the Navy's first operational drone rotorcraft, as well as Canada's Canadair CL-227 Sentinel, France's Marchetti Heliscope, Germany's Dornier Kiebitz, and the UK's Westland Wisp. Today, several varieties of micro drones and loitering munitions such as Israel's Rafael Spike Firefly have adopted the coaxial design. Larger coaxial rotorcraft such China's Norinco CR500 Golden Eagle, which can be equipped with multiple munitions, are beginning to make their way into operational use.

Multicopter drones are a type of rotorcraft that feature more than two rotors in a fixed position. Some multicopters have four propulsors – quadcopters – though others may have eight – octocopters – or more. Multicopters typically use electric-powered rotors to generate power, though other propulsor variations, such as ducted fans, exist as well. Multicopters are prized for their portability, stability, and maneuverability. A few of the earliest multicopter drones can be traced to the 1950s, when in 1958, Piasecki conducted a test flight of the PA-4 Sea Bat, a 2,220-pound (1,000-kg) tethered quadrotor drone designed for the US Navy (Piasecki Aircraft n.d.). In the mid-1980s, a little-known DARPA project funded the development of a design closer to the current conception of a multicopter: The Aerobot was a small "saucer-shaped" drone with four vertical ducts, each with an electric-powered propulsion fan (Munson 1988, 115). The recent popularity of multicopters can be traced to the rise of the consumer drone in the early 2010s. Today, multicopters are an increasingly common piece of military equipment. Indeed, so much so that some former consumer drone manufacturers like the French company Parrot are now dedicated primarily to building quadrotor drones for defense and safety applications (Mackenzie 2021).

Vertical takeoff and landing (VTOL) drones can take off and land vertically like a helicopter and cruise in a horizontal position like an airplane. Because VTOL drones can takeoff and land vertically, they do not require the runway infrastructure of fixed-wing aircraft. The fixed-wing capability, however, provides the aircraft with greater range and endurance than conventional helicopters. The multiple varieties of

VTOL drones may be distinguished by how each generates power for the lift and cruise modes of flight. The same propulsors on a tiltrotor, for example, are used for both the lift and cruise modes of flight and rotate position to re-orient thrust between the modes. A tailsitter also uses the same propulsors for lift and cruise, except the propulsors are in a fixed position and do not rotate; instead, the entire aircraft transitions from one flight mode to the other. Other types of powered lift aircraft have separate propulsors for the lift and cruise phases of flight. The Textron Aerosonde HQ has four fixed propulsors located on two twin booms to generate lift, and a fifth propulsor in the pusher configuration for forward flight.

4 Conclusion

Current trends point to a future in which drones are more lethal and commonplace in warfare. Drone producers like General Atomics and Turkey's Baykar are developing large aircraft like the MQ-9B SkyGuardian and Akinci with a greater weapons payload capacity than previous models and are evaluating ways of adding missiles with a longer range than those typically used by these aircraft (Trevithick 2023). Meanwhile, small armed loitering munitions are increasingly featured in the armament of a variety of crewed and uncrewed vehicles, including tanks, ships, and helicopters, among others. Originally designed as a means for attacking enemy radars, loitering munitions have lately assumed a much wider role in combat operations.

These developments reinforce longstanding thinking regarding the military purpose of uncrewed aircraft. Beginning with the "aerial torpedo" and "flying bomb" of the First World War, military planners have viewed drones as a means of reducing the threats posed by adversary fire to crewed aircraft and of engaging adversaries beyond the range of some conventional weapons. "These 'remotely piloted' vehicles show promise of extending the hand and mind of mind into combat situations where the man himself could not expect to survive," argued John Foster in a 1971 editorial (Foster 1971, 11). Today, over 100 militaries worldwide are believed to operate drones, a consequence of more than a century of uncrewed flight.

Seminar Questions

1. What invention was crucial to the development of the first pilotless airplanes?
2. For what purpose was the word 'drone' originally used to describe pilotless airplanes? How has the use of the word 'drone' to describe pilotless airplanes changed over time? Are there similarities between how it was used in its first instance and today?
3. What were the technical and operational challenges that the development in the 1970s of remotely piloted vehicles sought to overcome?

4. What does the failure of the Aquila program say about the risks entailed in the development of new platforms based on emerging technologies?
5. Identify a configuration of a fixed-wing drone and a vertical take-off and landing drone and describe the perceived advantages that that configuration could confer to its user.

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Amelie Theussen

4 Drones and International Law

Abstract: This chapter gives an overview of the challenges that military drones have posed for international law over the course of the last 20 years and how these challenges have developed in line with countries' drone policies and uses from one drone age to the next. It argues that, while drones used on active battlefields are subject to the same legal regulations as any other weapons system or platform, certain uses of drones enabled by the characteristics of drone technology – such as targeted killings outside active battlefields and increasing technological autonomy – and increasing proliferation cause substantial challenges for international law. There is still time to improve the regulation of drone use so long as other states are not yet employing their armed drones in a manner similarly extensive as the US, but this window of opportunity might be closing fast.

Keywords: Military drones, UAVs, international law, war, armed conflict, targeted killing

Since the United States conducted its first drone strikes in 2001 and 2002, significant controversy has emerged regarding the applicability of international law to drone technology and its uses. While some of the heated debate found at the beginning of this new technological era has subsided over the course of the last two decades, fundamental questions about the applicability of international law to military drones remain. Under which circumstances are drone strikes legal? Who can be targeted, and when? Does it matter who conducts the strikes? And how can their legality and legitimacy be assessed when everything is shrouded in secrecy? This chapter will give an overview over the key legal challenges posed by drones and the development of the debate about their proper use over time. While the history of the drone can be traced much further back in time, the 2002 strike in Yemen rang in what is now known as the "first drone age." On November 3, 2002, the Central Intelligence Agency (CIA) of the US used a drone to target and kill six people inside a car in Yemen, one of them Qaed Salim Sinan al-Harethi, the senior Al-Qaeda leader allegedly responsible for the attack on the USS Cole in 2000. This started what would become a massive campaign of targeted killings of suspected terrorists outside of active battlefields. Where this "first drone age" was characterized by an increasing number of US drone strikes – only a few other countries had access to the technology and even fewer were using it to strike targets – today the world finds itself in what Chris Woods, the founder of AirWars, has termed the "second drone age" (Farooq 2019). This is characterized by massive and uncontrolled proliferation of drone technology and its use to target and kill people (Farooq 2019). Over the course of the last few years, the number of states employing drone strikes went from just three – the US, UK, and Israel – during the first

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ten years of the 21st century, to include at least nine other states – Azerbaijan, France, Iran, Iraq, Nigeria, Pakistan, Russia, Turkey, the United Arab Emirates (Bergen, Salyk-Virk, and Sterman 2020); some sources also include Saudi Arabia, see Callamard and Rogers (2020) – and a host of non-state actors. Recent estimates suggest that at least 27 additional states are currently in the possession of armed drones (Bergen, Salyk-Virk, and Sterman 2020).

Given this accelerated proliferation, this chapter provides an overview of the sustained challenges that military drones have posed for international law and how these challenges have developed in line with countries' drone policies and uses from one drone age to the next. It investigates questions of when and where drone strikes legally can be used; who can be targeted; why and how it matters who conducts the strikes; and the effects of a lack of transparency on assessing their legality and legitimacy. The chapter argues that, while drones used on active battlefields are subject to the same legal regulations as any other weapons system or platform, certain uses of drones, enabled by the characteristics of drone technology, cause substantial challenges for international law. Divided into three parts, the chapter first traces the legal challenges of the first drone age, focused on the United States' use of drones for so-called "targeted killing," defined as the intentional and premeditated use of lethal force by a subject of international law (mostly, but not exclusively, states) against individually selected persons not in the physical custody of the targeting entity (see e.g. Melzer 2008; Miller 2016).[1] Using these to contextualize some of the key legal problems found with the use of drones, it then proceeds to consider the legal challenges that emerged due to the increasing proliferation of drone technology to an ever-larger number of state and non-state actors. Here, the chapter takes a closer look at state practice of the increasing number of states employing drone strikes. Finally, the chapter also looks to the future, analyzing the challenges the future development of drone technology and its proliferation will bring in form of a potential "third drone age".[2] Remote warfare is here to stay; but the endlessness of drone warfare, its distance from democratic processes, and the increasing autonomy of drones create legal challenges that will only become more acute in the future.

A note on the limitations of this chapter: while the chapter primarily focuses on international law, it includes references to domestic law where necessary and appropriate. However, it does not provide a complete analysis of any particular country's

1 It is worth noting that targeted killings can be conducted by many means, not only drones. Examples of other means include but are not limited to the use of Special Operation Forces, manned aircraft, or snipers.

2 This third drone age would be characterized by full spectrum drone warfare, including unmanned land, maritime and subsea vehicles, at the disposal of hostile state and non-state actors (Rogers and Kunertova 2022).

domestic regulation over drone technology and its use.[3] Additionally, and due to the focus of this handbook on military drones, the chapter does not address the challenges civilian use of drones causes for international and domestic law; nor does it address the use of drones by violent non-state actors in detail. These non-state actors often have no interest in abiding by the framework of international law (but not always, see Fazal 2018), and can efficiently use civilian platforms for tactical, operational and even some strategic effects (Chávez and Swed 2021).

1 The Beginnings: The US-Centric First Drone Age

The first drone age was characterized by a focus on the US's increasing use of drone strikes. Thus, this section examines the legal challenges that resulted from US drone policy in four areas: when and where the drones are used, who can be targeted, who operates the drones, and what is the appropriate level of transparency. In the years after 2002, it became clear that the US was running two drone programs: the first a military program on the active battlefields of Iraq and Afghanistan (and since 2014 also in Syria), controlled by the Pentagon; and the second a CIA run operation in countries like Yemen, Pakistan, and Somalia (Mayer 2009). Yet, despite this technical separation in programs and locations, several reports characterize many of these early drone strike operations as jointly run between the military and intelligence services (O'Connell 2009; Stone 2017). While the differences between the programs might be difficult to establish in practice, these differences have massive consequences for international law.

2 When and Where Does the Drone Strike Take Place and How Does that Affect its Legality? *Jus in bello*

One of the crucial distinctions is whether the drone strikes take place on an active battlefield, as part of an ongoing armed conflict, or not. If they take place as part of an ongoing war, international humanitarian law (IHL) applies. Here, the legal challenges posed by drone strikes are the same as any other weapon system employed (Schmitt 2011), that is, that drone strikes must abide by the fundamental legal principles of humanity, military necessity, proportionality, and distinction. Thus, this use of drone technology does not *per se* pose any new challenges for international law, be-

3 Here, literature on a wide range of topics exists, from aviation law (Hodgkinson and Johnston 2018) to public opinion towards domestic regulation of drones (West et al. 2019) to pick just two examples.

cause "it is an extension of conventional warfare" (Mayer 2009). Combatants may legally target each other and also be targeted with lethal force.[4] The basic principles and legal rules of IHL must be respected in the targeting process irrespective of whether the target is struck by a manned aircraft, a missile, ground troops, or an armed drone. Beyond the boundaries of the battlefield, however, the situation is one of peace, where the applicable human rights law is much stricter when it comes to the legal use of lethal force. This use of drone strikes – outside of active battlefields – has led to substantial legal challenges since the advent of the first drone age.

Where then are the geographical limits of the battlefield? After the terror attacks of September 11, 2001, the US declared a Global War on Terror, with President George W. Bush proclaiming "[o]ur war on terror begins with al Qaeda, but it does not end there. It will not end until every terrorist group of *global* reach has been found, stopped and defeated" (Bush 2001, emphasis added). The Authorization for Use of Military Force (AUMF) by the US Congress also had no geographical limitations (US Congress 2001). The truly global reach of the US interpretation of their war on terror became even more visible when the AUMF was referred to as justification for the US actions against the Islamic State of Iraq and Syria (ISIS), a terror organization that did not yet exist in 2001 (Brandon-Smith 2017). More recently, the AUMF has been put forward by the Trump administration as a legal base and argument for the legality of the drone attack that killed Iranian general Qassem Soleimani, the commander of the Quds Force, in Iraq on January 2, 2020 (Edmondson 2020; for a copy of the document, see United States Institute for Peace 2020).

This view of a global battlefield, however, is not supported in international law, where a nexus to an ongoing armed conflict must be present for IHL to apply; thus allowing for the use of lethal armed force – such as a drone strike – against military targets. This nexus refers to a link between the targeted individual or conduct and ongoing hostilities between the warring parties. A nexus exists if, firstly, there is an armed conflict between the state considering the drone strike and the armed group being targeted ("general nexus to an armed conflict") and, secondly, if the targeted individual is a member of the group and directly participating in the hostilities (a determination of direct participation includes a requirement of a "belligerent nexus"; Lubell and Derejko 2013). This is a middle position in the debate between two opposing views. The US view is that individuals belonging to an armed group (with what is known as continuous combat function) or civilians directly participating in the hostilities gain combatant status within the armed conflict wherever they are located, creating a battlefield of potentially global scope. On the other end of the spectrum lies the

4 In this context, the argument that drone strikes could in fact be better suited to abide by the principles of IHL has been put forward repeatedly. A drone's intelligence, reconnaissance and surveillance capabilities and its precision-guided munitions allow better verification of targets and collateral damage assessments (Schmitt 2011). Whether this argument is considered convincing or not, drones are subject to the same rules as any other weapons system.

view that the application of IHL is limited to the territory of the warring parties only, and any drone strikes on third states' territory are governed by the human rights law relating to law enforcement, which allows lethal force only as last resort to protect people from a grave threat to life (for an overview of the discussion, see Pejic 2014).[5]

3 When and Where Does the Drone Strike Take Place and How Does that Affect its Legality? *Jus ad bellum*

This connects to another set of legal disputes related to the right to resort to armed force under international law enshrined in the UN Charter (*jus ad bellum*). Even if the drone strike is not conducted as part of an ongoing armed conflict, it might still be a legal recourse to armed force if it is conducted in accordance with the rules regulating when armed force can be used. The drone strike could be conducted for example with either the consent of the territorial state, or UN Security Council authorization pursuant to Art. 39 and 42 of the UN Charter, or congruent with the conditions for self-defense specified in Art. 51 UN Charter. In the case of US drone strikes in the first drone age, it seems the governments of Yemen, Somalia, and Pakistan had given their consent, even though Pakistan seems to have withdrawn this consent in 2013 (Miller and Woodward 2013). But even when the targeting state has the consent by the territorial state, it is still obliged to respect the rules of IHL and human rights law in its drone strikes (see the discussion on the previous pages).

The US put forward the view that its drone strikes in Global War on Terror were conducted as self-defense: in 2010 Harold Koh, Legal Advisor at the State Department, expressed "in this ongoing armed conflict [with Al-Qaeda], the United States has the authority under international law, and the responsibility to its citizens, to use force, including lethal force, to defend itself, including by targeting persons such as high-level al Qaeda leaders who are planning attacks" (Koh 2010). Drone strikes in self-defense, however, also must live up to several principles to ensure their legality. Even though Article 51 refers to the right to self-defense *if an armed attack occurs*, it is generally held to include the right to self-defense against an imminent attack. Yet, the boundaries of this element of imminence are not agreed upon. Dinstein gives the strict position on immi-

5 A minority position also suggests that drone strikes outside active battlefields could potentially create their own armed conflict, resulting in the application of IHL, but this is unlikely to be legally accepted because there is a long jurisprudential tradition that armed conflict must have a certain level of intensity of protracted armed violence with a certain level of organization of the parties to the conflict (*ICTY, Prosecutor v. Dusko Tadić a/k/a 'Dule'. Decision on the Defense Motion for Interlocutory Appeal on Jurisdiction*, 1995, para. 70; see also Lubell and Derejko 2013; Pejic 2014).

nence, drawing the line at an attack that “is actually in the process of being mounted. There is no need to wait for the bombs to fall [. . .] if it is certain that the armed attack is under way (even in a preliminary manner)” (Dinstein 2011, 200).

The US position is on the other end of the spectrum, as it includes what has been called “pre-emptive self-defense”: the right to “prevent threats that have ‘not yet crystallized but may materialize’” (Pejic 2014, 72). This broad legal interpretation of the right to self-defense put forward by the US – and used as a justification for the country’s drone strikes – is not generally accepted by other states and legal experts. Additionally, the legal principles of necessity and proportionality must be respected in any act of self-defense. This means, among other things, that the territorial state must be given the opportunity to address the threat emanating from its territory. The victim state can act in self-defense only if the territorial state is unable or unwilling to address the threat (Schmitt 2011). It also means that all peaceful courses of action to address the attack are either unavailable or have been exhausted, and the use of force taken in self-defense must not be excessive beyond what is necessary to stop the attack. US drone strike policy has been criticized for not living up to these legal requirements (see e.g. Boyle 2015), as the US reserved for itself the right to anticipatory action using lethal force “even if uncertainty remains as to the time and place of the enemy’s attack” (Bush 2002, 15), provided that capture would be infeasible or too risky (US Department of Justice 2011).

A recent example of the US employing this argument as justification can be found in the context of the 2020 assassination of Iranian general Soleimani. The US Department of Defense stated that Soleimani was “actively developing plans to attack American diplomats and service members in Iraq and throughout the region” and thus the “strike was aimed at deterring future Iranian attack plans” (US Department of Defense 2020). Also President Trump referred to Soleimani “plotting imminent and sinister attacks” (The White House 2020). However, no evidence of these attack plans was brought forward, and over time the administration’s justifications seemed to shift (see Stepansky 2020) – including a reference to the AUMF for example, as mentioned above. This once more created substantial ambiguity surrounding the legal basis for such drone strikes.

A final discussion related to the principle of self-defense was the question whether a state can invoke the right to self-defense against an attack by a non-state actor (see e.g. Dinstein 2011, 224–230; Pejic 2014). This understanding seems to be the norm in state practice today, for example the Resolutions passed by the UN Security Council in the aftermath of the terror attack of September 11, 2001 reaffirm the right to self-defense in regard to the terrorist attacks (United Nations Security Council 2001a, 2001b; see also Dinstein 2011).[6]

In short, as the UN Special Rapporteur on extrajudicial, summary, or arbitrary executions, Philip Alston, noted in his 2010 report, “[o]utside the context of armed

6 But see for example Kammerhofer’s analysis of changes (or a lack thereof) in jurisprudence and scholarship related to the rules on self-defense since 2001 (2015).

conflict, the use of drones for targeted killing is almost never likely to be legal. [. . .] [It] would be very unlikely to meet human rights law limitations on the use of lethal force" (Alston 2010, para. 85).

4 Who Operates the Drone Program?

In addition to the debate over what constitutes a battlefield and under what conditions force can be legally used, the question of who operates the drone program has legal consequences. As opposed to US military personnel, CIA drone operatives do not have combatant status under international law, but meet the characteristics of civilians directly participating in the hostilities and can thus be legally targeted by the adversary.[7] The lack of combatant status, which shields lawful combatants from prosecution for, e.g., murder for their use of lethal force in armed conflicts (provided that they adhere to international humanitarian law), also means that these CIA drone operatives can theoretically be prosecuted for their actions in other states, as well as domestically. The US Military Commissions Act of 2009 and commentary on the US Manual for Military Commissions related to the Military Commissions Act of 2006 seem to criminalize direct participation in hostilities by civilians as a war crime; this was only resolved by a change in wording in the 2010 US Manual for Military Commissions (Crawford 2015).

5 A Lack of Transparency and (Democratic) Oversight?

The biggest challenge of the first drone age, however, was the secrecy and lack of transparency that shrouded the US drone program from thorough legal review and assessment. Successive US administrations insisted on the program's lawfulness, but prevented any in-depth investigation of such claims, resulting in a lack of "any oversight, of checks and balances" (Richard Armitage, former US Deputy Secretary of State on the US drone campaign in Pakistan, quoted in Woods 2015, 286). Harold Koh, a legal advisor to the US State Department under the Obama administration and one of the key figures behind the American legal justification for targeted killings through drone strikes, remarked after his resignation that the "persistent and counterproductive lack of transparency" caused "a growing perception that the program is not lawful and necessary, but illegal, unnecessary, and out of control" (quoted in Gusterson 2016, 118). While there exists congressional

7 In fact, CIA operatives would have to be seen as what the US has previously condemned as *unlawful combatants*, which seems both hypocritical from a US perspective and morally, if not legally, objectionable.

oversight of the US drone program through several congressional committees – such as the armed services committee, intelligence committee, foreign affairs committee, judiciary committee, and appropriations committee – these committees seem to be lacking a comprehensive picture of the drone program for a number of reasons, such as turf wars between committees and departments, the need to protect operational information, compartmentalization of information and classification issues (Rosenthal 2018). Müller and Böller (2023) argue that Congress used a policy window around the confirmation hearings of John Brennan for CIA director in 2013 on the one hand to enact some limited changes to drone strike oversight and to pressure President Obama to increase transparency, but on the other hand allowed the lack of transparency to continue by blocking further, more fundamental, policy changes. They also conclude "that Congress can contest and scrutinize the Commander-in-Chief's drone strike program, but intra-congressional turf wars may frustrate more stringent and long-lasting oversight reforms" (Müller and Böller 2023, 20). Much of the US position seems to have been an *ex post facto* legal rationalization: UN investigator Ben Emmerson notes that "one of the reasons it took them [the Obama administration] so long to break cover and to state authoritatively what their legal justification was [. . .] was partly because they weren't themselves sure what their legal justification was" (quoted in Woods 2015, 282).

The first drone age was dominated by the US use of drones, and thus the vast majority of (if not all) legal analyses from this time take the US drone program as their point of departure. As Alston summarizes, US policy resulted in "a highly problematic blurring and expansion of the boundaries of the applicable legal frameworks – human rights law, the laws of war, and the law applicable to the use of interstate force. Even where the laws of war are clearly applicable, there has been a tendency to expand who may permissibly be targeted and under what conditions" (Alston 2010, 3). As the first drone age drew to a close, many of these legal challenges of military drones still remained. Over the last two decades, consensus has emerged that it is not the *nature* of drones *per se* that fundamentally challenges international law, but mainly their *use* for targeted killing outside active battlefields. The core legal issues discussed above remain: when and where are drone strikes conducted, who conducts them, and how can their lawfulness be assessed, if they are shrouded in secrecy? With its thin and disputed legal justifications, the US set up a questionable rulebook for others to follow, creating sustained fears that other states would take a similar approach once the technology proliferated.

6 The Second Drone Age

Now these fears might become reality. The world has entered a second drone age, characterized by the massive and uncontrolled proliferation of drone technology and its use to target and kill people (Farooq 2019). The number of states employing drone

strikes went from just three – the US, UK, and Israel – during the first ten years of the 21st century, to include at least nine other states – Azerbaijan, France, Iran, Iraq, Nigeria, Pakistan, Russia, Turkey, the United Arab Emirates (Bergen, Salyk-Virk, and Sterman 2020); some sources also include Saudi Arabia (see Callamard and Rogers 2020) – and a host of non-state actors over the course of the last few years. At least 27 additional states are currently in the possession of armed drones (Bergen, Salyk-Virk, and Sterman 2020).

Despite the widespread proliferation of drone technology of the last years, fears that other states will adopt the US's rulebook and further erode international law have not yet become a reality. An investigation into state practice by those 12 (or 13) states that conduct drone strikes reveals that, thus far, no other state has adopted a drone policy as expansive as the US. Rather, states have employed their armed drones in existing armed conflicts, where their use falls under the same principles and regulations as any other weapons system.[8] While this is of course is no guarantee that these countries and their drone strikes abide by IHL in any individual case, it shows that Alston's fear of a blurring of legal frameworks and expansion of permissible targets has not yet materialized beyond US policy and that international law remains suitable to govern military drones (Theussen 2021).

From a legal perspective, Germany is an interesting case: after several years of debate, the country decided in spring 2022 to arm its Heron drones, which it decided to buy – unarmed – from Israel in 2018 (tagesschau.de 2022). The draft resolution for the budget committee requires as guiding principle the use of drones only for the protection of German armed forces, that the drone operators are stationed in the area of operation, and that any parliamentary mandate for the use of force explicitly provides for the use of armed drones (Szymanski 2022). Germany has felt the spotlight over its involvement in the US drone wars after it was revealed in 2015 that "the sprawling U.S. military base in Ramstein, Germany serves as the high-tech heart of America's drone program" (Scahill 2015). The US right to use the property comes with the condition that nothing they do violates German law; and Germany generally considers drone strikes legally permissible only on active battlefields. Additionally, Germany signed the Rome statute of the International Criminal Court and Germany's Code of Crimes against International Law applies "even when the offence was committed abroad and bears no relation to Germany" (Section 1, 2016). Germany could thus prosecute US soldiers for war crimes, even though it has been reluctant to do so (Scahill 2015). In 2019, a higher administrative court in the German federal state of North Rhine-Westphalia ruled that

8 Some scholars have argued that this is the case because there is a prevailing distinction between the rules that states choose to follow in relations among each other and those they choose (not) to follow in relations with violent non-state actors (Keating 2022) – the latter of which were the primary target of the US in the past two decades.

(a) Germany has jurisdiction over a drone strike conducted by the United States by virtue of the assistance it provides and the central role it plays in United States strikes. In other words, Germany has a duty to protect the right to life of those targeted;
(b) There is no basis in international law for preventive self-defence;
(c) Germany should make greater efforts to ensure respect for international law in United States military operations involving German territory (Ramstein airbase);
(d) United States assurances regarding the legality of activities undertaken through Ramstein airbase are insufficient;
(e) The provision of assistance to unlawful United States strikes is a matter of law, not politics, and thus cannot be justified through foreign policy alone. (Callamard, 2020, para. 28; see *Urteil über die Unterbindung der Nutzung der Air Base Ramstein für bewaffnete US-Drohneneinsätze im Jemen*, 2019; *Urteil über die Feststellung von Pflichtverletzungen in Bezug auf bewaffnete US-Drohneneinsätze in Somalia*, 2019; Oberverwaltungsgericht für das Land Nordrhein-Westfalen, 2019)

Thus, in the second drone age, the legal questions surrounding the historical and contemporary US drone program are far from resolved.

The legal challenge that moves to the forefront in the second drone age, however, is that of regulating the proliferation of drone technology. Even though most states seem to abide by international law in their use of armed drones and the feared blurring of legal frameworks has not yet spread much beyond US practice (Theussen 2021), there is a substantial risk that widespread proliferation of drone technology might lead to a loosening of the regulatory framework, as state competitors to the US mimic US policies, non-state actors get their hands on increasingly sophisticated drone technology, and wars progressively involve more unmanned vehicles in a decisive manner. Existing agreements, the Arms Trade Treaty (ATT) and UN Register of Conventional Arms, Missile Technology Control Regime (MTCR), and Wassenaar Agreement are inadequate to limit the spread of drone technology. Firstly, the number of participating states is limited, with the major exporters of drone technology – China, Israel, and the US – in many cases choosing to remain outside these regimes. Secondly, even for the signatories of the different regimes much of the reporting is either voluntary or difficult to enforce. Thirdly, a mismatch between the provisions and technological advances means the regimes are badly suited to regulate the proliferation of drone technology. In 2016, under the initiative of the Obama administration, 53 states issued a Joint Declaration that recognized the applicability of international law, importance of responsible export in line with existing arms control norms and voluntary transparency measures, and a willingness to continue the discussions on the topic (US Department of State 2016). Since then, however, not much progress has been made. While especially the ATT has the potential to regulate the export of drones, significant efforts are necessary to bring the main exporters of drone technology into the regime in the future (for a detailed analysis of the regimes and their shortcomings see Orozobekova and Finaud 2020).

This becomes even more problematic when one considers the proliferation of civilian drone technology to violent non-state actors. As Chávez and Swed (2021) point out, legal-normative constraints require states to employ drones that can live up to

the standards of international law; while violent non-state actors, who fight asymmetric conflicts and have little interest in abiding by international rules that would disadvantage them, can efficiently use civilian drone technology to reach their goals. The civilian nature of these types of drones makes them even harder to regulate, giving rise to a discussion on how to regulate dual-use technologies (Schulzke 2019).

7 The Coming Third Drone Age and Future Challenges for International Law

What does this mean for the future? There can be no doubt that drones are here to stay, and their use will increase also in other domains than air, for example under water (Osborn 2021). The third drone age will not be limited to drones as we know them – the ubiquitous unmanned *aerial* vehicles – but instead involve unmanned ground, surface, and sub-surface vehicles that significantly expand the domains of drone threats to “full-spectrum drone warfare” (Rogers and Kunertova 2022, 2).

Each use of the technology either strengthens the legal norms regulating its use or weakens them – and the legal challenges outlined in this chapter will need to be addressed if a further decline of the international rules-based order is to be prevented. A further weakening of the distinction between war and peace, and thus the threshold for the use of force, is not the interest of liberal democratic states (Theussen and Jakobsen 2021). This means working towards transparency, regulation, and reflecting over the standards one’s own drone policies set for other actors in a world where the proliferation of drone technology is expanding exponentially.

This chapter ends with a few reflections on what a drone warfare in the future – the coming third drone age – could look like and its consequences for international law: drones allow the use of force at lower cost and invite less scrutiny (see e.g. Krieg and Rickli 2019), which allows such uses of armed force to continue (almost) without geographical and temporal bounds. It also lowers the threshold for the use of armed force in the first place, if there are no major risks attached to it (in form of soldiers’ lives, state finances, and the political survival of governments). In this sense it is the continuation – maybe even pinnacle – of technology driven spectator war (McInnes 2022), and might end up increasing overall levels of violence. For example, the Obama administration argued that the War Powers Resolution did not apply to the operation in Libya, “in part because there were only planes and drones above Libya, rather than troops on the ground” (Woods 2015, 280). The US Global War on Terror already provides an example of a “forever” (Koh 2013) or “endless” war (Hartnett et al. 2022). In international law, peace is seen as the normal state of affairs and war as the exception. Creating an endless state of war would contribute to the erosion of human rights, such as the right to life and due process. Stanley McChrystal fittingly pointed out that “[a]lthough to the United States, a drone strike seems to have very little risk and very

little pain, at the receiving end, it feels like war. Americans have got to understand that" (quoted in Woods 2015, 285). In the future, with more actors in possession of armed drones, also the US might increasingly find itself at the receiving end.

Maybe war mostly will be replaced by what Brunstetter refers to as *jus ad vim* – the just uses of limited force short of war – in need of their own ethical, and possibly also legal, framework? But do these instances of limited force, the use of military drones here being grouped together with no-fly zones, targeted airstrikes, and use of special operation forces, serve to avoid escalation to large scale war, or do they make the use of armed force more likely? (Brunstetter and Braun 2013; Brunstetter 2021) If anything, the proliferation of drone technology in the second drone age and continued legal ambiguity seem to point to the latter.

Finally, the question of increasing autonomy of drones has legal consequences. Much has been written about the (legal) challenges of artificial intelligence and lethal autonomous weapon systems, and the more autonomous drones become in their operations, the more these fundamental challenges – of responsibility, attribution, and lawful decision-making – become central. While this seems like a problem for the future, a report from the UN Security Council's Panel of Experts on Libya mentions an explosives-bearing Turkish-made quadcopter drone that autonomously detected and attacked Haftar's forces in Libya in 2020 (Zitser 2021). Together with technological advancements in precision, range, size, and production processes, the increasing autonomy of unmanned vehicles also reinforces the challenge to regulate the proliferation of such technology to an ever-larger group of states and non-state actors.

Soare points out "[t]hat international actors are reluctant to relinquish political and military control over technological tools and enablers is a powerful argument that their revolutionary impact can be shaped, avoided, and/or postponed through regulatory processes. This is why the national and international 'legislative gap' on practical applications of emerging technologies is so consequential" (Soare 2021, 276). If the decisive use of drones in the interstate war between Armenia and Azerbaijan and their use in the war between Russia and Ukraine can be seen as the harbinger of the future to come,[9] finding international agreement to overcome the ambiguities regarding the application of the existing legal framework to military drones is urgently necessary. This chapter shows that there still is a window of opportunity for regulation, but it might be closing faster than one would wish for.

9 Generally, drones are vulnerable to anti-aircraft fire, and are thus seen as less important in interstate warfare; but as Franz-Stefan Gady of the International Institute for Strategic Studies points out the war "should drive home to European armed forces what such systems can do to ground forces that lack adequate air defences" (quoted in *The Economist* 2020). And this does not take into consideration increasing multi-drone deployments and improving swarming capabilities that can be used to overwhelm defense systems (Rogers 2022).

Seminar Questions

1. Under which circumstances are drone strikes legal?
2. How do we assess the legality of drone strikes in the light of necessary secrecy for reasons of national security?
3. What future do you see regarding the use of drones in war and conflict?
4. How can we overcome the legal challenges of drone use and proliferation?
5. Is the international regulation of drone use possible? Is it likely? What avenues are there for regulation?
6. How should the use and proliferation of drones be regulated? What rules should be agreed upon and why?
7. How do domestic and international law interact regarding drones?
8. How can the use (and proliferation) of civilian drones for military purposes be regulated?

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Kathrin Maurer

5 Drone Imaginaries

Abstract: Drone art is art that negotiates, represents, and experiments with drone technology. Many artists use amateur drones for aesthetic production and creatively make use of the sensorial possibilities of the drone. The focus of this entry is on military drone art and it shows how drone art engages with the visual scopic regimes of military drones and how those configure violence as a form of man hunting. For the French philosopher Grégoire Chamayou man hunting embodies a type of cynegetic (hunting related) violence, which military drones can execute by the power surveillance. Research often focuses on the political, legal, anthropological, and ethical aspects of this type of violence; the aspects of its visual framing are often underexposed. In order to change this shortcoming, this entry draws attention to the medial aspects of this violence by investigating the drone's scopic regime. The scopic regime refers to the drone's visual configuration, i.e. its ocular operations of capture, its optical perspective on the target, the visual sensing of the drone pilot, as well as the target's range of vision. Excursions to the works of contemporary visual artists will be conducted in order to illustrate aesthetic interventions against the drone's visual superpower.

Keywords: Military drone technology, drone art, visual culture, aesthetics, scopic regime, violence

1 What Is Drone Art?

Drone art is art that engages with drone technology. Many artists use amateur drones for aesthetic production and creatively make usage of the sensorial possibilities of the drone (Maurer 2023). A film in which a prosumer drone takes aerial shots, photography that works with the drone perspective, or paintings in which the drone sprays graffiti. For this handbook, military drone art is in focus, which encompasses artistic works that deal with aspects of military drone warfare. In popular culture the military drone has played starring roles, such as in Gavin Hood's movie *Eye in the Sky* (2015) or in "Hated in the Nation," a 2016 episode of the popular Netflix series *Black Mirror* in which artificial bee drone swarms turn into killing machines. Besides popular culture, there is also experimental and avant-gardist art about military drones. For example, Tomas van Houtryve's photographic series *Blue Sky Days* (2014) which consists of images shot by a drone in domestic settings, reversing the military perspective of the drone and directing it at US territory. Or literature: Atef Abu Saif's *The Drone Eats with Me: Diaries from a City under Fire* (2015) narrates the experience of the everyday threat of drone bombardment. Or he one-woman drama *Grounded* (2013) by the British playwright George Brant

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consisting of a monologue by a former F-16 fighter pilot who became a military drone sensor operator. Drone art about military and security practices of remote sensing warfare has grown during the last decades, and an important term to describe theses artistic negotiations are "drone imaginaries," referring to the imaginary nature of these interpretations of remote sensing technology (Graae and Maurer 2021). These drone imaginaries are not just fantasies and figments of artistic imagination. They have a collective, societal dimension as they reflect how military sensory operations configure, construct, and control communities, and thus, connecting with Charles Taylor, show how cultural practices can shape social imaginaries (Taylor 2003).

Although these artistic military drone imaginaries are culturally, medially, and genre-wise very heterogeneous, and it is difficult to pin down "drone art" as one homogenous artistic genre, the artworks nevertheless could be characterized by one common feature: they all share the intention to critically negotiate drone technology through artistic expression (Braeunert and Malone 2016). In general, artworks, may it be a novel or visual art installation, can epitomize autonomous representation, as they do not have to obey any sense-making rules or societal conventions or codes. Art can be made for profit, but it does not have to; art can be religious or political, but it also can be interesting, boring, ugly, or beautiful. It is precisely this freedom to observe the world beyond instrumental reason that can make art into a powerful discourse of investigation. As modern theories of aesthetics often emphasize, art can be a medium through which to voice critique. From the German Romantics to the Frankfurt School to systems theory, art offers the conditions in which to observe the world differently, that is, for example, noninstrumentally, affectively, self-reflexively, and nondiscursively. Thus, drone art can be a source for new epistemic perspectives and insights: Aesthetic negotiations of military drones can reflect the vulnerability, uncertainty, and fallibility of drone technology, and can obfuscate techno-optimistic narratives about the drone's precision (Adey 2016). Drone imaginaries can evoke dissensus: they can be negotiated, criticized, ironized, queered, celebrated, and made strange. In particular scholars in the humanities have used drone art as type of epistemic prism which provides knowledge about drone warfare that is otherwise underexposed in academic debates about the efficiency of drone warfare. But also for scholars of the social sciences and engineering, the study of drone art works sheds new light on drone discourses. One central focus in cultural, medial, and aesthetic research is the critical debate of the "scopic regime" of the drone; a term to be explained in more depth in following part of this chapter by showing some nodal points to war theory, ethics, and questions on international law.

2 The Scopic Regime of the Military Drone

The term "scopic regime," originally used in film and visual analysis (Jay 1993), refers to the drone's visual framing, e.g. its ocular operations of capture, its optical perspective on the target, the visual sensing of the drone pilot, as well as the target's range of vision.[1] The scopic regimes of drones change the rules of conventional warfare, the latter understood as an open confrontation between several parties with the goal of the capitulation of one side. Conventional war connects to a legal discourse, in which specific laws of war (the *jus ad bello* and the *jus in bello*) define its justification and its means. According to just war theory, the concept of the *jus ad bello* for example addresses the idea that the political leaders have to be held accountable for the reason to go to war, for the intention, for the proportionality of the risk, and for the probability of success; the notion of the *jus in bello* refer to the rights in combat and raises issues of justice within battle (Walzer 2000).

The scopic regime of military drones impedes these laws by conducting violence under the auspices of the man hunt. From Ancient Sparta, the pursuits of the biblical figure of Nimrod, the chase of the heretics in the Middle Ages, the colonial quests of the natives of the New Worlds to the genocides of the 20th and 21st centuries, man hunting is as old as mankind. Even though its practices and its missions decisively differ throughout history, they nevertheless share this mission: That is the animalization of humans into prey. According to the French philosopher Grégoire Chamayou, who wrote the groundbreaking book *A Theory of the Drone* (2015) about drone war and violence, man hunting is not only about the techniques of tracking and capturing, but also about the frames of recognition, that control procedures of exclusion and draw the lines of demarcation between hunter and prey within the human community.

This logic of hunting in drone war is certainly visible in the military video capture technology with the mythical name of Gorgon Stare (Michel 2019). Scholars of the humanities know the Gorgon sisters well, the monsters from Greek mythology, and one of them, Stheno, who could turn any who viewed her into a stone. Since 2011 she works for the American military, the CIA, and for the DARPA (Defense Advanced Research Agency, responsible for the development of new technologies for the use by the military). Gorgon Stare is a wide area surveillance technology able to capture motion imagery of a whole city, which in turn can be analyzed by humans and artificial intelligence (Gregory 2011). This technology incorporates a spherical array of nine cameras attached to an aerial drone armed with Hell Fire Missiles. Together with her

1 I am indebted to the editorial board of the journal *Media, War & Conflict* for giving me permission to reuse some passages from my previously published article for this chapter (Kathrin Maurer (2017) "Visual Power: The Scopic Regime of Military Drone Operations." *Media, War & Conflict* 10, no. 2: 141–151). Approximately two thirds of passages in the sections "The Scopic Regime of the Military Drone," "Looking Back," and "Invisibility" are reused from this article.

brother, the surveillance technology Argus-IS (again a telling name), who contains over hundred cellphone-like cameras, they can quilt together a mega-stream of images into a large-scale mosaic and feed them into networks of the ground stations.

Gorgon stare's real-time, full-motion and high-definition video feeds and its connection to a so-called theater of war certainly overcome the limitations of time and space. Gorgon's sight from above is like a God's eye, all-encompassing and all-seeing. As a drone pilot admits: "Sometimes I felt like a God hurling thunderbolts from afar" (Gregory 2012, 192). Given these Olympian powers suggested by Gorgon Stare, a parallel to Jeremy Bentham's panopticon seems imperative. Like the panopticon, Gorgon Stare suggests a totalized and synoptic view on the surveyed object. The philosopher Zygmunt Bauman has pointed out that the drone's visual field of surveillance is in even more powerful than the one of the panopticon since it neither requires spatial partitions nor fixed architectural demarcations. This scopic gaze becomes quite clear, is embodied by the spherical distribution of cameras of Gorgon Stare and Argus-IS, that no longer are organized via a centralized verticality (like in the panopticon's watch tower), but rather a multi-faceted gaze that can constantly change its constellations.

Many art works on military drone operations reflect against this powerful gaze of the drone and attempt to question its hypervisual powers. They often aim to demonstrate the drone's fallibility, its proneness to error, and its prejudices. In the following, I discuss some examples of contemporary drone art and show their diverse reactions, negotiations, and reflections with and about the scopic regime of the drone.

3 Looking Back

The art installation titled *Not a Bug Splat* is a work that clearly aims to counteract the scopic regime of the drone. A group of artists – Ali Rez, Saks Afridi, Assam Khalid, Akash Goel, Insyia Syed, Noor Behram, and JR's Inside Out Project – and Pakistani villagers unveiled a giant vinyl banner picturing the face of a child in a lush green field in the region of Pakistan, where drone attacks regularly occur. According to the organizers, the child has lost his parents and his siblings in a drone strike. The enlarged face of the child, her stern gaze and wide-open eyes fixate the viewer from afar, the grainy black and white background suggests the aesthetics of military visual material.

In drone war, there are no face-to-face encounters, no opportunity to look back at the perpetrator, who remains invisible and out of harm's way (Waldmann, Kennedy, and Rogers 2016). This absence of the act of mutual seeing reveals its violence, as the face embodies vulnerability and nakedness; it is a body part that appeals to nonviolence (Stubblefield 2020, 124–125). The absence of face-to-face contact has sparked a debate about whether drone warfare is unethical per se and is particularly evident in the work of two opposing scholars: Chamayou argues that drone warfare engages in necroethics (an ethics that is not about living well but killing well) and thus concludes

that drone operations are deeply unethical (Chamayou 2015, 2012). Bradley Strawser states by contrast that drone warfare is ethical and that one even has a moral obligation to engage in remote warfare (Strawser 2010, 342–368). The artwork *Not a Bug Splat* engages with this ethical debate by taking side with Chamayou, as it demonstrates the ethical problem of a warfare that assassinates people rather by confronting people with declaration of war. Its exclamatory title *Not a Bug Splat* echoes the ideology of hunting that Chamayou has described in his work, since in drone speak, targeted bodies are often referred to as bug splat suggesting a sense of an insect being crushed. It is also the name of a Defense Department computer program for calculating collateral damage. The art installation *Not a Bug Splat* points to the zoological model of violence that is executed by drone attacks; the frame of the one-sided mirror is broken and the artistic image seeks to reinstall the frames of humanness.

This one-sided scopic regime of drone targeting and its biopolitical ramifications also constitutes the condition for a colonial gaze. The drone pilot gets immersed and close to the target, but the target has no possibility of looking back, there is not chance for seeing, pointing to, or recognizing the enemy. The targets do not have the right to look back, as Nicholas Mirzoeff formulated it in his counter history on visuality and colonialism: “The right to look claims autonomy [. . .] the claim to a political subjectivity and collectivity. It means requiring the recognition of the other in order to have a place from which to claim rights and to determine what is right” (Mirzoeff 2011, 1). Thus, this form of intimacy that is based on the abjection of the right of looking is highly selective, and it can often lead to the construction of targets “othering” civilians into enemies. Well-known are the incidences in drone operations in which civilians are mistakenly taken for terrorists because their movements are interpreted as suspicious. Cameras are mistaken for rifles, children for adolescent warriors, prayers as Taliban signifiers, and peaceful daily behavior is construed as tactical movement.

To put into legal terms, the scopic regime of the drone violates the *jus in bello* which addresses the necessary differentiation between combatants and non-combatants. The whole visual set-up of the screen of the drone pilot, its co-presence, its simultaneous proximity and distance, its high-definition reality effects provide an illusionary frame of transparency. It constructs a place of heightened visibility, in which one side cannot get out of the frame; this side is petrified by a gaze that predominantly seeks to annihilate.

There are many artists that negotiate this colonial gaze of drone operations, and Ronak K. Kapadia’s work *Insurgent Aesthetics: Security and the Queer Life of the Forever War* (2019) provides an excellent discussion of this. His book shows how Arab, Muslim, and South Asian artists (often living in the diaspora in the US or Europe) grapple with present day security practices. For example, the artworks by Pakistani American visual artist Mahwish Chisthy’s drone art paintings. In her gouache paintings, she combines traditional folk-art practices with the motive of the aerial vehicle of the drone. She stains her paper with tea following the practice of miniature painting. Her painting of military UAVs are colorfully ornamented, which reminds of Pakistani street art. These paintings make the cold drone, the foreign and the distant killing machine, into some-

thing familiar and close. One could read this as an attempt to break the one-sided frame of the colonial gaze of the drone: to undo the asymmetry, to formulate a voice, and to look back. The exceptional anthology *Drone Vision: Warfare, Surveillance, Protest* (Tuck, et. al., 2022), edited by Sarah Tuck and colleagues, also makes it a priority to have the artists and their work speak about drone war and its colonial ramifications. Besides this optics of colonial exclusion, drone artists have also dealt with another aspect of the drone's scopic regime: That of the drone's invisibility.

4 Invisibility

In his *Theory of the Drone* Chamayou draws upon the myth of Gyges to describe another characteristic of the drone's visual field. In classical mythology, Gyges was a shepherd who discovered a magical ring that could make him invisible. Armed with this new power, Gyges eventually killed the king, married the queen, and seized the throne. A drone pilot represents the Gyges of the 21st century, however instead of a shepherd that aims to gather his flock to a community; the modern Gyges is a hunter. Like the hunter, who often makes himself or herself invisible to lure his prey, the drone operator remains hidden as well. And, like the hunter, who uses intermediaries (such as beaters, packs or dogs) to chase his prey, the drone pilot also implements auxiliaries insuring his maximum protection and invulnerability.

Thus, the drone Gyges erases the conditions of possibility for a fair fight, since he or she does not take on any life or death risk. Of course, one can argue that the demand of a fair fight is an archaic claim. There might have been fair fights between knights in chivalrous warfare and in the pre-Napoleonic Wars, but it is questionable a fair fight does exist in modern warfare. There is also the issue, whether one ever would wish for a fair fight in combat. Nevertheless, one should not rule out the importance of fairness as a weak claim. Rather, following Chamayou, the myth of Gyges raises a question on human virtue, and in which ways virtual (invisible) violence clashes with the idea of a virtuous war. In Plato's *Republic* the story of Gyges is used to ask the following questions: What happens to virtue, if it becomes possible to evade responsibility for one's actions? Can an invisible person, like Gyges, be virtuous? Traditionally the military ethos privileges courage, sacrifice, and heroism. These virtues gave war what Clausewitz saw as its presumptive moral force, which was closely connected to reciprocity: In order to kill with honor, the soldier must be prepared to die. But what happens when all of this becomes unnecessary? What are the consequences of this virtueless and post-heroic war? Not only the ones that live under drones, but also the ones who fly them often consider them as the weapon of the coward. The fierce protest against medals for drone pilots has shown that invisibility and heroism do not go together. This is not a lament about the good old wars and a comeback of heroes. Rather the goal is to show that drone missions (by inflicting violence as man hunt) trigger fundamental changes

on how we interpret military action, heroism, and courage. Gyges' visual scope sets off profound changes in the ethics of sacrifice and courage. In drone operations, we no longer herald traditional associations with military courage, such as risk taking, physical and emotional strength, and the will to sacrifice. Rather the drone suggests the virtue of outsmarting the enemy by technology and this virtue is exclusively based on the idea of auto-preservation and self-protection.

In this context the work by the current film maker and visual artist Omer Fast is of utmost interest. Fast's 30-minute cinematic work "5000 Feet Is the Best" (2011) offers a critique of the visual power of drones by precisely investigating the drone's scopic dimension of invisibility. The film stems from a series of conversations the artist conducted with a former US Air Force Predator Drone operator now working in Las Vegas as a casino security guard, who reflects on his daily duties and the psychological effects of drone missions in Pakistan and Afghanistan. The film weaves together vignettes of original footage from these interviews with their fictional re-staging. It does not follow the rules of a factional documentary, but by means of imaginative elements (dead can be alive), strong light and shadow effects, and the inversion of locations (drone strikes take place in Nevada) constantly merges the boundaries between sharpness and blurriness, transparency and obscurity, absence and presence.

The film clip presents the drone's full visual power, which in turn can see everything, even the smallest details. Through the time-space compression of drone technology, the drone pilots are absorbed in a type of paradoxical co-presence, close to the killing and far away at the same time. Fast's film shows the effects of the drone's invisibility onto the drone operators. The tracking of the child on the bicycle in a modern settlement in the Nevada conveys the terror of surveillance, but also the psychological toll this invisibility takes on the drone pilots. Thus, the drone pilots experience a form of new intimacy, which is opposed to a cold killer attitude and a detached play-station mentality (Gregory 2011). This intimacy can be the cause for Post-Traumatic Stress Syndromes (PTSD) for the pilots and studies have shown that drone pilots experience symptoms such as anxiety, stress, hyperarousal, and flashbacks (Chappelle et al. 2014).

The film discloses the psychopathology of the drone not only by showing its random kill-acts on domestic territory (US) but also by homing in on the shadowy face of the drone pilot. His eyes are constantly searching; his gaze conveys restlessness, and emotional brokenness. The hunter seemed to have become the hunted, the one who is followed by images of the automated killings of the target and haunted by nightmares. The figure of the drone pilot seems to ask himself in silence: Was I just a killer, an assassin, or a real soldier? Were the killings out of the sky legitimate or just acts of sheer murder? The film does not provide answers, but certainly disrupts the myth of visual sovereignty of drones and deflects the idea of beneficial bombing in the spirit of the aseptic nature of drone interventions.

5 Drone Art and Network-Centric Warfare

The drone art examples discussed in the previous sections attacked, scrutinized, and criticized the scopic regime of the drone. However, one also needs to understand drone operations beyond the scopic regime as a network-centric form of warfare. That means that military drone operations rely on dissociated, decentralized, and networked data configurations (Holmquist 2013; Amoore 2009; Chandler 2020). Since drone war is based on a whole network on data exchange, sensors, interfaces, platforms, and human/non-human operators, there is no longer a centralized all-seeing sovereign agent (a panoptic cyclops eye) that steers all the actions and agencies of a drone operation and can produce these clear-cut dichotomies. Rather drone operations are much more dispersed and diffuse. Many drone artists have taken this network-character of military drone operations into consideration, and the book by the media scholar Thomas Stubblefield, *Drone Art: The Everywhere War as Medium* (2020), shows in an in-depth discussion of art works that reflect this a-centralization of warfare. In this respect, the work by the visual artist, author, and geographer Trevor Paglen is important. Paglen photographic projects that engage with secret worlds and hidden spaces within the American military and the CIA have been discussed widely. His video *Drone Vision* (2010) is particularly important, since it exhibits the nonhuman vision of a drone and demonstrates a network-centric from of warfare (see Figure 5.1). The video exploited a security flaw in the transfer of images from drones to a US-based pilot via unencrypted satellite uplinks. The source material for the video was intercepted by an amateur hacker from an open channel to a commercial communication satellite over the western hemisphere. The five-minute film mostly shows aerial images from the perspective of the drone, which hovers in the sky filming mountains, roads, trucks, houses, and clouds.

Figure 5.1: Trevor Paglen, *Drone Vision*, 2010, Archival pigment print, 16×20 in. Courtesy of the Artist, Altman Siegel, San Francisco and Pace G.

Visible at the images' margins are technical metadata about the time, location, aircraft, altitude, and mission, which can be sorted through by data analysts and algorithms. Possible individuals in the image are turned into a network of dots, patterns, and clusters as signification points for targeting. *Drone Vision* shows operative images that establish a kill grid, decide about life and death, and dehumanize the subject. The film demonstrates that there is no longer a clear dichotomy between seeing and not-seeing, between surveillant and surveilled. Rather the drone's visual power lies in an accumulation of data from multiple interfaces, agents, and data sources that make it hard to differentiate who or what is seeing, and who or what is in control.

Paglen's artistic video is on first sight not easy to recognize as art, as it stages a mimicry to "real" security footage. There are other drone artworks that deal with the network-centric aspect of drone operations by being more artistically performative. That is, for example, James Bridle's work called *Drone Shadow*, which the artist began to design in 2012. In his *Drone Shadow* series, Bridle draws monumental chalk outlines of an imaginary MQ-1 Predator Drone on street corners or parking lots. He does the drawing himself, but he also designed a manual that invites street artists to do the same (often it is a whole group that draws). The making of the diagram is part of the artwork and one can find his Drone Shadows in many places of the world, such as London, Istanbul, and Ljubljana. As the marking of a crime scene, the aerial views of these diagrams seem to enact a profound displacement. Like Fast's movie, the drone is connected and replaced into Western territory. On the one hand, these *Drone Shadow* photographs associate a type of all-seeing eye executing a centralized and consolidated power (scopic and vertical regime). But on the other hand, watching these videos about how these graffities were made gives us another insight about the networked power of the drone. The drone is fragmented and its diverse body part are being put together by its assemblers. While making the drone, they do not have total view from above. Rather they only see its parts, limbs, and individual pieces. This fragmentation of the drone and all the scattered movements of its builders symbolize Gregory's idea of the kill-chain and its dispersed collective power. Gregory states that "the kill-chain can be thought of as a dispersed and distributed apparatus, a congeries of actors, objects, practices, discourses and affects" (Gregory 2011, 241). As each predator drone requires over hundred people of personnel to operate, makes clear this form of diffused power. The film shows how the builders moves back and forth, the fast-forward effect illustrates and even enhances the processes of automatization. The drone drawers move according to the idea of completeness, but the artwork never really shows the drone a whole. Its totality remains hallucinatory, the individual movements are fragments towards a virtual future. The drone remains a shadow, and due to the chalk a transitory image. This fragmentation (and in this sense also the deconstruction of the scopic power) of the drone becomes even more evident, in light of how Bridle's *Drone Shadows* circulate on social media and the internet. The images gained their own speed and movement by becoming an uncontrollable trace in the everyday media sphere.

6 Art as Source of Knowledge about Drone Warfare

Drone art can give scholars and academics insight about drone war operations. Drone art shows that a military drone is not just technical apparatus or instrument: it is machine that produces discourse. Drones do not operate somewhere out there, independently of us; they are our sensing avatars, deeply enmeshed with cultural and political contexts. Drone art expresses that drones can make worlds, and that they can act as "epistemological engines" (Jensen 2020, 419). We can learn from drone art about the drones' visual regimes, its politics of exclusion, and its violence. These aspects are often underexposed in debates about the efficiency and surgical nature of remote warfare. Drone art reminds us to reflect critically about discussions that fetishize the drone as the new super weapon. The scholar Caren Kaplan shaped the term "drone-o-rama" characterizing the today's media hype around drone technology and suggested that historizing the drone can be enlightening to learn about its technological capacities (Kaplan 2017, 167). In sum, the ability of artistic representations of military drones to critically reflect our expectations of the drone and reconfigure common narrative about this technology can deliver a crucial perspective when studying drone wars. Aesthetic works on military drones have a distinct potential to communicate about drone technology and can act as seismographs for political and institutional changes of warfare.

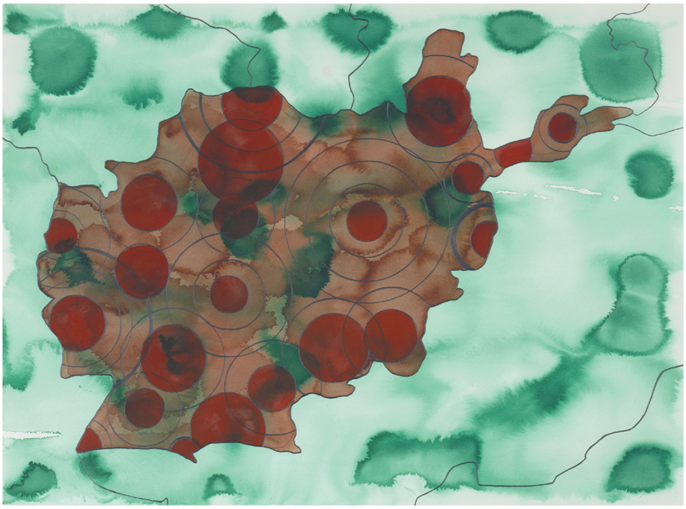

Figure 5.2: Elin o'Hara slavick, *Afghanistan I, 1979 and Infinite Reach, 1998*. Courtesy of the artist. © Elin o'Hara slavick.

Elin o'Hara slavick's painting *Afghanistan I, 1979 and Infinite Reach, 1998*, demonstrates this aesthetic power (see Figure 5.2). By means of intense colors, ornamental lines, and a strange sense of beauty, this painting acts as a powerful aesthetic intervention and counteraction against the cold and dehumanized view of the drone and its aerial vison regime of surgical strikes. Not only does the painting reflect on the aerial view as an aggressive gaze through its red blots and target lines but also fleeting lines point to the aesthetic power of drone imaginaries. It is, however, imperative to keep in mind, that when we use drone art as a source of knowledge or even as a method to gain scholarly insights about drone war, we do harm to the works of art. Artworks, also the ones on drones, are autonomous and not always as easy to instrumentalize. We always reduce the artwork's complexity and uniqueness when we hope to prove our arguments and discourses with them. Artworks have many hermeneutic and interpretative layers, and sometimes they just make the technology strange and do not deliver reliable scholarly results.

Seminar Questions

1. What is drone art?
2. What can we learn from drone art about military drone operations?
3. Why is it important to engage with drone art when studying drones?
4. What are the themes of drone art?
5. What is the scopic regime of the drone?

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Caroline Kennedy-Pipe and Afzal Ashraf

6 A Gendering of Drones

Abstract: Drones and the war in Afghanistan have transformed the work of war. Floating high above the battlefield, these uncrewed vehicles allowed states to survey and strike enemies at will and at a distance; operators sat thousands of miles from the sites of contestation. On the ground prohibitions on the female in the front line were finally lifted and across the skies, women operated drone strikes. Old debates about the fitness of women to serve rang hollow in the face of the modern battlespace. Yet as this article argues UAVS highlight the many ways in which technology, battle and the role of women and men remain resolutely gendered.

Keywords: Combat, drones, gender, masculinity, men, Taliban, trauma, United States, women

1 A Gendering of Drones

What the wars in Iraq and Afghanistan illustrated is that women were finally accepted on to the 'front line.' After years of exclusion from combat, women became both integral to the conduct of counter-insurgency (COIN) through units such as Female Engagement Teams (FETs) but also important to the air wars conducted via drone technology in the War on Terror. This incorporation into the business of killing was recognized with the proposed lifting of the US combat exclusion clause which was announced in 2013. Such inclusivity seemed to indicate that debates about the fitness of women for the business of killing had been resolved: issues of gender had been transcended by the need for women to operate in the battlefields and skies of Afghanistan as well as over the aerial spaces of Pakistan and Yemen. The reliance on a certain kind of COIN and the escalation in drone strikes enabled women to be placed (at least in official rhetoric) on equal terms with men. This is one important narration of the last 20 years. But of course, it is not quite that simple. Gender divisions have not disappeared and there are important questions over how women on the 'receiving' end of violence encountered these wars. This chapter examines debates over gender and killing, the incorporation of women in COIN, and the effect of drone strikes on men and women on all sides.

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2 War: The Business of Men

We should start with a definition of what we mean by gender when we address the study of war. In its simplest incantation it refers to an identification of masculinity with characteristics of strength and militarism and of femininity as consisting of a vulnerability, a nurturing nature, and peaceful activities. (A few caveats need to be placed on this definition. Sex and gender are not necessarily the same. Identifying men with masculinity, militarism, and a propensity for violence and women with femininity, vulnerability, and victimhood, reproduces many of the gender dichotomies feminist theorists have long sought to dismantle. Doing so also obscures the fact that one may identify or be identified with masculinity, femininity, or neither gender, irrespective of actual sex.)[1]

Such a reading may, often does ignore the gender-specific vulnerabilities men suffer in and after conflict. We may think of the men in the 9/11 wars, identified as 'insurgents,' then incarcerated, tortured, and sometimes 'disappeared' into a 'black site.' All these activities were justified at least in part on the gender and ethnicity of those identified as enemies. The targets of drone strikes are nearly always men identified as 'militants' sometimes simply because of appearance and demeanor. Signature strikes, for example, were based on a very particular view of maleness and so-called 'pattern of life' activities. In one case drone operators attacked a convey of families in Afghanistan after they stopped their journey to pray as dawn broke – it was assumed (wrongly) that the group because of this religiosity were Taliban. In that attack as in others, women were killed in the 'fall out' from a drone strike. This issue of collateral damage preoccupied non-governmental organizations (NGOs) and international; bodies throughout the Obama years. Yet it is worth noting that women, although in fewer numbers, have been and are directly targeted by drones. One example was the July 2022 case of a Turkish drone strike which killed three members of the all-female YPJ (Women's Protection Units) in northeast Syria (the YPJ forms part of the US-backed Syrian Democratic Forces) (Farberov 2022).

There are myriad controversies around the use of drones. Questions have been posed about the ethical and legal justifications for this type of activity. There are endless debates about remote warfare and the business of killing by machine: does this type of virtual war mean that war is no longer heroic but, in a post, heroic phase? Do we need warriors of the humankind? Should we think of warfare (at least for the

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1 We recognize the complexities of the terms male and female and man and woman. For the purposes of this piece, we acknowledge that the terms male and female, man and woman are not interchangeable. For this article we adopt Tseng's view that 'What it means to be a male or female is taken to originate from physical characteristics but being a man or a woman holds broader meanings with cultural concept of masculinity coming in to play. Therefore, we have chosen in the main to use the label of man and woman precisely to acknowledge the multiple variety of cultural representations those terms carry (Tseng 2008).

West) as vicarious (Waldman 2021)? Vicarious war is an important concept: war is a distant, a subcontracted, and a technical activity in which ostensibly human activity, let alone women and their work, play little part: not relevant to any calculation and hidden from view. Yet as we will go on to see, drones do not render the everyday, the mundane if you like as irrelevant, but rather highlight the importance of understanding the role of men and women in and under drone warfare (Manjikian 2013).

3 Traditions

In the established literature on women and war, feminist scholars have identified certain key issues. One starting point for understanding gender, conflict, and war is with the ideas and reality of patriarchy. Cynthia Enloe (2004) defined this as understanding a type of the structural and ideological system that perpetuates the privileging of masculinity. It is indeed difficult to argue that the world of international politics has not been one which has privileged certain notions of masculinity. What Enloe (1989) pointed out in her seminal book, *Bananas, Beaches and Bases* is that our global world is neither a natural nor a neutral one. It is one created and sustained using certain types of power. Enloe has invariably urged that to understand these power structures, it is necessary to unpack what patriarchy means in practice: she highlighted that it was and is precisely the labor of women, domestic or public, which has constituted the necessary ingredient which has permitted men at both the highest level (politicians and presidents) and the lowest (say, the ordinary conscript) to go about their business. Be it in fighting wars, forging alliances, or conducting the business of the state abroad, women have kept the home fires burning.

Thus, women have typically been excluded from the public practice of these activities, especially in war. Historically engaging in combat, was the province of men. This construction of war as a domain of masculine virtues had wider implications. Jean Bethke Elshtain (1987) explored these in her book *Women and War*. She established a distinction between 'beautiful souls' (women) and 'just warriors' (men) as the core of theorizing about the respective role of women and men in war and indeed across society. These narratives of war, she argued, played a significant role in reinforcing traditional gender roles within a domestic/social context ingraining multiple connections between war, male violence, and the state in Western notions of citizenship.

Elshtain's thesis is supported by much of the archive which illustrates the relationship between patriarchy, war, and national politics: specifically, how militaries serve and are constructed to reinforce certain norms. War and combat have represented the highest aspirations of the male members of political, social, and cultural elites. In ancient Greece, some form of military training was regarded as a prerequisite to manhood or high office (Kennedy-Pipe 2017).

While much feminist scholarship has necessarily concentrated on illuminating Western interpretations of masculinity and violence, it is perhaps worth pausing to connect across to non-Western military culture. For example, the Afghan Taliban, like all other groups of fighters, view their military strategy, their use of weapons and their targeting through a culturally constructed prison. While the code of honor (*Nang*) drives the imperative to respond to perceived aggression and particularly to perceived losses, other factors both internal (cultural) and external (driven by international intrusion) shape when and how Taliban choose to engage with the enemy. All these factors, to varying degrees, are viewed through a patriarchal gendered lens. (Original research on this topic is currently somewhat limited, forcing a cultural analytical approach.) (Wyatt and Dunn 2019.)

Hence, the concept of *Nang*, links male honor to the honor of the tribe's or family's women. Defending that honor is considered a vital component of manliness. In that respect, it is not fundamentally different from many societies throughout the world, including Western ones. Yet, what distinguishes the Pashtun cultural code (*Pashtunwali*) is the degree of overtness and of emphasis placed on gender roles throughout that culture. This linking of manliness to the capability to deploy violence to preserve honor achieves both a symbolic and practical manifestation through a Pashtun saying, *tha saro kali* (guns are a man's jewels). Traditionally, honor was determined by hand-to-hand fighting. When Pashtuns made a transition from swords to guns, this allowed for a degree of stand-off capability: note here that drones posed a series of challenges for Taliban in both practical but also cultural ways. This is a subject to which we will return.

Combat remains associated across cultures with masculine values such as physical strength, risk taking, and courage. It is also associated with male bonds (Janowitz 1960). Martin Van Creveld has argued that militaries must be maintained as bastions of pure manliness or degradation will surely follow (Van Creveld 2013). In certain societies, those men who would not or could not fight might be classified as 'women': ridiculed as lacking manliness. Female virtues were eschewed within many military cultures (Dixon 1976). Military training was always (and is still) designed to reinforce certain notions of masculinity. Indeed, as Anthony King (2016) noted, a certain notion of masculinity remains dominant within Western militaries.

Since the incorporation of women in the fighting forces in Afghanistan and Iraq though, a new gender code has emerged in relation to female soldiers: the 'honorary man.' As King has pointed out this may represent a 'minor' revision rather than a cultural revolution in gender affairs but although very narrow does represent a material transformation as a new category (King 2013). Moreover, this idea has facilitated and demanded a revision of gender concepts and interpretations of women in the business of contemporary wars. It was in the conduct of the wars in Iraq and Afghanistan that woman soldiers began to attract considerable academic and military attention.

4 Women, the 9/11 Wars, and the Work of Combat

After the chaotic scenes when foreign troops finally left Kabul in August 2021, the optimistic start to the Afghan War was but a distant memory. Twenty years earlier, President George W. Bush had promised not only to liberate the country from Taliban but also emancipation for the women caught under the repressive regime. Indeed, as Bush declared a War on Terror, the first lady, Laura Bush in a radio address on November 17, 2001 connected the two ambitions asserting that "the fight against terrorism is also a fight for the rights and dignity of women." *Time* magazine followed with a report on the plight of Afghan women entitled "Lifting the Veil" (Shepherd 2006).

From the start of Western intervention there was thus a gendered agenda to modernize (Westernize) social and economic relations within Afghan society. Where this emphasis on women ranked as a motivating factor in US foreign policy remains moot but in Afghanistan, initiatives included laudable ambitions to educate girls, ensure a higher standard of care in female healthcare, protect women from forced marriage, and a string of human rights innovations. All these efforts meant a challenge to established social conventions and norms in a highly religious and conservative society.

During the Iraq War, Allied forces had initially largely bypassed the female population, not least because of the sensitivities of engaging with women in a traditional society. Insurgents in turn took advantage of these cultural sensitivities by disguising themselves in the all-enveloping female clothing to avoid detection while perhaps plotting or perpetrating attacks. (This was not a new tactic as during the 1966 Algerian conflict for example, insurgents cognizant to the ideas of the French army would dress in Burqas and easily cross through checkpoints which were usually closed to men but open for women. On representations of women during the French war in Algeria see the work of Maria Flood [2017]). This 'disguise' of insurgents in Iraq in turn forced Allied forces to deploy women soldiers (such as the Lionesses) at checkpoints precisely to enable the searching of females without causing offense.

The most significant difference between these two theaters of war was that the insurgency in Iraq was primarily an urban affair while the insurgents in Afghanistan operated principally out of rural locations. It was easier to conduct raiding operations against suspected insurgent hideouts in the villages of Afghanistan than to raid the townhouses of suspected insurgents in Iraq. Events such as the Fallujah uprising and, more significantly, the Najaf rebellion by the Mahdi Army meant that the coalition forces in Iraq limited themselves to certain areas of towns and cities and avoided the significant public backlash likely if they conducted any operations considered intrusive or violent by the public. (On the challenges faced by women service personnel in Iraq, see Hunter 2021). There was little need for the predominantly male soldiers having to deal with women and girls in a domestic setting (Ashraf and Kennedy-Pipe 2022; Ashraf 2022).

It was the Afghan theater that provided Western military women with opportunities which had been long denied in terms of front-line operations. Deployment in Af-

ghanistan opened opportunities in field artillery, combat arms positions, and special operations. From 2009, there was a need for women to accompany American troops on patrol, especially after the military 'surge' and the parallel civilian surge designed to extend reach into Afghan civilian populations. All of this spearheaded a significant shift in American policy, eventually leading in 2013 to the announcement of the lifting of the embargo on women in combat, an adjustment which would be implemented in 2016.

5 Feminizing COIN?

The US developed two programs to enable military forces to contact Afghan women: the Female Engagement Teams (FETs) and the Cultural Support Teams (CST). FETs had existed since 2009 but became more integrated in 2010 when General McChrystal issued a directive to contributing NATO nations to "train and employ females for duty on engagement teams to the maximum extent practicable" (Coll 2012). It is worth discussing the reasons for this innovation. Some of those who provided briefings to senior commanders deploying to Afghanistan on cultural intelligence and psychological operations have noted that central to *Pashtunwali* is the concept of *Nang* (honor). Three important factors contribute to Pushtun honor: *Zar* (gold or wealth), *Zan* (women and girls), and *Zamin* (land or property).

To operate in Afghanistan, FETs were trained to focus on interactions with Afghan females as the average ISAF (International Security Assistance Force) forces had difficulty in connecting with this part of the population. US COIN strategy recognized that to 'win' over the people, women had to be co-opted. In 2006, the US Field Manuel FM-3-24 explicitly mentioned 'winning over' the women as a critical gateway to obtaining support. The hope articulated by experts such as David Kilcullen was to build networks of enlightened self-interest to undermine support for the insurgents. The view was that the women in the community might be able to exert influence over the boys in the family. (Kilcullen's thinking was that the women in the community might be able to exert influence to undermine support for the insurgents. Along with US Field Manuel FM-3-24 such thinking embodies a couple of weak assumptions. First, it is assumed that the threat primarily comes from the public's support for the insurgents rather than from public antipathy or outright hostility towards what was perceived to be a Western occupying force. Second, it assumes that women must be made enlightened and self-interested before they can exert influence on men) (Kilcullen 2008; Ashraf 2022).

The attempts to influence Afghan women were rarely made outside the context of a kill or capture mission or an intelligence gathering mission into villages and houses. Such missions invariably deployed drones for pre-mission surveillance and for command-and-control overwatch during the operation. Without the use of drones, it is un-

likely that such missions could have been conducted. Any cultural appraisal and sensitivity which was attempted therefore collided with the demands of a typical Western military operation which involved breaking down doors, storming into property, and even intruding into female quarters. These missions could and often did offend all three cultural taboos. It was partly to mitigate such affects that woman soldiers were introduced. It at least meant that the handling and interrogation of women could be carried out without the offense that would be keenly felt if men engaged in these tasks within domestic settings. Therefore, it was strategic, operational, and tactical necessity rather than liberal principles which accelerated gender equality in the military's employment of women in these combat roles.

Laleh Khalili (2011) has argued that the gendered nature of the wars in Iraq and Afghanistan were most obvious when soldiers encountered the local population. In these interactions, women in the community were typically perceived as civilians while men – that is all males over the age of 14 – were 'coded' as combatants. Therefore, men were targeted as enemies both by combat units and by drones. Scholars have raised too the thorny issue of race and ethnicity, as well as masculinity pointing to a narrative common to Western discussions of the wars in the Middle East – that of white men rescuing, protecting non-white women from non-white men. The nature of that 'protection' has been questioned in terms of colonial discourses, issues of female agency, and solidarity and the more prosaic question of how inherently violent actions have consequences on the ground (Cooke 2002; Spivak 1985).

For example, in their kill/capture missions the US used a variety of tactics, including precision strikes and night raids on the homes of Afghans suspected of colluding with terrorist groups. These night raids caused widespread upset among the Afghan community and caused considerable friction between President Karzai and his allies. Civilians were killed but the domestic space was also violated and what became apparent is that the cultural 'sanctity' of the home was not well understood by many Westerners.

Female soldiers were meant to reassure the local women during night raids that they as women would protect the wife, the mother, and the children of the household as the raid was conducted. This occurred even as the men of the household, the husbands, brothers, fathers, and sons were hunted down. Accounts by those women soldiers who served in this capacity have related instances of removing their helmets to show their faces and demonstrate to the household that they too were women and would protect the family during the raid. How the Afghan women were meant to survive economically after the removal of the men from the community was a key issue. Dyvik (2014) has raised several important questions about the effects of Western military practices on Afghan women. She asked: did it have a positive effect on their daily lives? Were their concerns listened to in substantial ways? Did the increased attention paid to Afghan women open substantial spaces? These important questions have in practical terms been rendered irrelevant by the Taliban takeover in 2021, but they remain important in terms of understanding if/how soldiering equates to a more

or less nuanced COIN (Manjikian 2013). When the training of Western women soldiers is scrutinized it becomes apparent that the military mission or some form of intelligence gathering took priority over any cultural sensitivities. In other words, killing insurgents was more important than protecting and winning over the hearts and minds of the female population. As such, and whatever the good intentions, this perpetuated rather than refined the ill-fated counter-insurgency practice put in place.

Whatever the evidence from the FETs, for those who sought the inclusion of women into battle on equal terms with men there was much from the Western female experience to ponder. Precisely because in COIN there is no front lime, no forward area, women were serving on many fronts. Vulnerability to attack was all too obvious, especially given the way Improvised Explosive Devices (IEDs) came to litter the landscapes of the Middle East. Afghan women too albeit in small numbers were incorporated into the business of COIN. Some 6,300 women served in the police service, the Air Force: some worked in the Female Tactical Platoon alongside US Special Forces on missions in which they performed a myriad of dangerous roles (4,253 Afghan women served in the police, 1,913 in the Army and 146 in the Air Force). These women appear to be somewhat forgotten, although some were – as the Taliban returned to power in Kabul – transported for a new life in the US (Ripley 2022). (It is unlikely that any of these women were directly involved with operating drones, but the Afghan army was invariably supported by US intelligence, surveillance, target acquisition, and reconnaissance [ISTAR] assets which were increasingly dominated by drone capability.)

There are many questions over the deployment of soldiers of whatever gender onto the battlefield. While there had been a general acceptance of the need after the shock of 9/11 to remove Taliban and hunt down the perpetrators of the assault on the US homeland, the Iraq invasion in 2003 promised to fatally undermine Western cohesion. Ugly accusations flew as European states such as France refused to support the US invasion, while the British public proved to be avowedly hostile to the war if not the service personnel deployed. Iraq was eventually abandoned to its fate with attention turning to the ‘better’ war in Afghanistan.

6 A Drone War

President Obama had made much of his staunch opposition to the ‘dumb war’ in Iraq but proved unable to resolve the Afghan quagmire. He did, however, change the nature of US activity in that war, and although initially supporting a troop surge, adopted a strategy of ‘boots off the ground’ in a bid to cut US losses. The politics of the war in Afghanistan became mired in the unfolding chaos in both Libya and Syria as well as the unexpected (at least for the US) consequences of the Arab Spring. Despite the assassination of Osama bin-Laden in 2011, a decade after the destruction of the Twin Towers, President Obama could not abandon the War on Terror especially after the emergence

of ISIS. As has been documented, Obama became increasingly enthusiastic about the use of drone technologies to wage war (Boyle 2013). G.W. Bush had authorized drone strikes in a secret order less than a week after the 9/11 attacks. By 2011, the US Air Force was training more pilots for unmanned aerial vehicle (UAV) work than for any other single weapon system. In both Iraq and Afghanistan, there was a distinction between counter-insurgency missions and the counter-terror wars; the CIA conducted drone and even ground-based operations against Al Qaeda and other terrorist organizations in those two countries with the military concentrating on insurgency. The programs were the source of considerable controversy not least because of the secrecy which surrounded missions and numbers killed. It was through this program that the president could issue 'kill or capture' directives adding to concerns over both the ethical and legal process in which drone killings took place.

The armed drone became President Obama's weapon of choice with 563 strikes carried out either in signature strikes, where, as we discussed earlier, the individual's identity is unknown, or in precision strikes on a named individual. In both signature strikes and in precision strikes it is the drones' unique capability to silently and persistently loiter in order to identify males of a fighting age as potential targets and to identify women and children as potential collateral damage to avoid, which is something that maned aircraft cannot easily perform. Without drones the gendered nature of targeting would have been nearly impossible, certainly not on the scale that it occurred. Women usually were not the actual target of such strikes but were usually part and parcel of the collateral damage which inevitably accompanied these aerial assaults. By collateral damage we accept the standard interpretation of this phrase but would note that more work still needs to be carried out on how women have been affected in terms of mental health by drone strikes and living under the threat of these machines as they hover in the sky (Kennedy-Pipe, Rogers, and Waldman 2016). Nearly 50% of the Afghan population, it is estimated by the World Health Organization (Synovitz 2021), has suffered from some form of mental health issue. This is hardly a surprise after so many years of war, but it is striking that Afghanistan is still the one country in the world in which female suicide rates are higher than those of men. An important future research question is just how drone warfare contributed to the endemic ill health of the population within Afghan society.

A prima facie case for mental health consequences exists in one of the few ways open to Pashtun women for self-expression, through short poems. The agony of the aerial war is expressed through poetry and song which can pervade even happy occasion such as weddings. One such verse commemorates the horror faced by families as NATO helicopters mercilessly strafed their male family members working in the fields:

> What should I do, oh God?
> My homeland of Sangin is besieged by NATO helicopters.
> (Griswold 2014)

Another poem written by a woman who lost her son, Nabi, in a drone strike curses the West:

> My Nabi was shot down by a drone
> May God destroy your sons, America, you murdered my own.
> (Griswold 2014)

As in most cultures, it is the women who primarily perpetuate cultural norms by influencing their children. While Nabi's mother prays for divine retribution against American sons, it can only be left to the imagination as to how many mothers want some retribution and suffer the consequences of bereavement after a drone strike. It would be a grave mistake to assume that the war in Afghanistan really ended in August 2021. There are many consequences, material and human, which have yet to unfold.

Recent history tells us that wars rarely end but rather they transform. It is too early to tell how the conflict in Afghanistan will evolve but cultural analysis indicates that whatever form it takes in the future, the women of Afghanistan will continue to shape, to an extent, the gendered memory of that conflict, if mostly through the way they narrate that war and their experiences. Trauma is not easily forgotten.

Evidence collected from Pakistan about those living under drones provides evidence that these machines created considerable anxiety for those on the ground.

> Drones hover twenty-four hours a day over communities in north-western Pakistan, striking homes, vehicles and public spaces without warning. Their presence terrorizes the women and children, giving rise to anxiety and psychological trauma amongst civilian communities. (Knuckey 2012)

As the Center for Human Rights and Global Justice (CHRGJ) report points out, those living under drones suffer the constant worry that a deadly strike may be fired at any time, and the knowledge that they are powerless to protect themselves. This in turn alters both behavior and community rituals. The US practice of striking one area multiple times, and on occasion killing those who rushed to help the injured or pick up body parts, meant that civilians became increasingly scared of being killed in a second or third strike. In addition, some community members stay away from important tribal gatherings in case any meeting is regarded or perceived as suspect (Knuckey 2012). There was also evidence that parents across regions where drones operated kept children at home from school (Cachelin 2022). The work that has been carried out on female mental health in the country also points to the contributory factors of domestic abuse and more recently the emotional despair engendered by the return of Taliban (Synovitz 2021; Kovess-Masfety et al. 2021).

Some feminist scholarship has helpfully noted that machines such as drones may permit a rethinking of traditional gender roles. Historically men have protected women, now it is possible to think about the drone as the 'protector' enabling a vision of the battlefield to survey the enemy and then if deemed necessary remove the

threat through execution. The drone in this version of events becomes a 'protector.' There is no necessity for anybody, male or female to be placed in harm's way. In short, the drone seems to allow the dirty, human, and intimate business of war to be side stepped (Manjikian 2013).

Much of the early work on the drone assumed that the major challenge with its use would be to sanitize killing – the screen, the control and distance would render the practice of killing as somewhat like a video game. A second concern was that democracies, because of a lowered risk to troops, might prove themselves more 'war prone' (Sauer and Schornig 2010). Politicians such as Obama and more latterly Presidents Trump and Biden might find it difficult to resist the temptation to destroy enemies in this remote and risk-free fashion: especially as drone killing proved to be in certain circumstances, such as killing extremists in Pakistan or Somalia, rather popular with the US public. Female citizens have though exhibited more doubts than their male counterparts about the use of drone killing. A Pew Report for example found that men were more likely to support strikes than women and whites were more likely to support than blacks or Hispanics (Lerner 2015; Lushenko and Kreps 2022). The whiff of patriarchy and colonial attitudes infest the use of drones.

7 Vulnerabilities

We have already described some of the human vulnerabilities in drone warfare for those on the receiving end. Those operating the drones, whether male or female also suffered trauma, despite the geographic distance from the targets. Distance from the battlefield has not quite turned out in terms of the pilots as a 'cure all,' for the activity of killing. Although safe from the physical stress of combat, recent surveys demonstrate that drone pilots do suffer trauma after missions in which they view, survey, and then kill the target (Clark 2022). Intimacy is achieved from the persistent surveillance operations that necessarily take place before the strike itself. Familiarity with the target and his or her family means a connection, maybe even a form of empathy is experienced. Some of the events witnessed may include highly distressing scenes: images of fighters killing, soldiers destroyed by an IED, and some pilots remained concerned about the targeting of the wrong people. According to one drone operator interviewed in *The New York Times* in the spring of 2022:

> There were missile strikes so hasty that they hit women and children, attacks built on such flimsy intelligence that they made targets of ordinary villagers and classified rules of engagement that allowed the customer to knowingly kill up to 29 civilians when taking out an enemy. Crews had to watch it all in color and high definition. (Philips 2022)

Some 46–48% of Reaper and Global Hawk drone operators suffer significant psychiatric symptoms including sadness, guilt, poor concentration, anxiety, and sleep distur-

bances. The incidence of post-traumatic stress disorder (PTSD) was lower than that displayed in military personnel returning from deployment but exhibited a higher incidence of psychotic symptoms than the compatriots who operate manned systems (Saini, Raju, and Chail 2021). Speculation as to why this may be includes notions that pilots flying in crewed aircraft do not have the intense burden of surveillance of victims over a protracted period, may experience the 'rush' from risk taking and may also enjoy greater respect and indeed admiration from peers and the public as to their heroic activities. The drone pilot who returns home from the office everyday has less purchase in the public imagination. Indeed the 'low status' of the US drone operator has been widely commented upon (Bayard de Volo 2016). This poses the question of why killing by hi-tech weapons is distasteful, maybe even shameful. One answer may lurk in the idea that high-tech weapons operate as a binary to the official story of the traditional war hero: the 'office' worker in a drone booth is not any kind of warrior and therefore of lower status (Bayard de Volo 2016).

Drone pilots encounter a degree of hostility within institutional structures. In the case of the UK, Peter Lee has thoughtfully explained that there may be concern that the Reaper crews represent an unmanned/uncrewed future. They are accordingly the thin edge of the wedge in which the human is no longer central to war (Lee 2018). Drone pilots can be regarded as inferior to those pilots who take to the skies above a zone of conflict. In the US this was made clear when Chuck Hegal withdrew the Distinguished Service Medal in 2013 just months after the award had been announced by his predecessor as secretary of defense, Leon Panetta. The medal was meant to reward service for those cyber operators and drone pilots who had not set foot on the battlefield (Londono 2013). The debates over whether these pilots should receive service medals evoked controversy about whether and how those 'off' the battlefield should be honored with a 'Nintendo' medal. One specific objection was that this medal seemed to elevate pilots and technicians above the 'purple heart' medal which is awarded to those who had demonstrated 'valor' on the battlefield itself. In short, the argument turned on notions of gallantry, courage, and sacrifice. One comparison between those who serve, embodied the point that even a sniper operating at a distance still had risked life and limb: the drone pilot does not take risks (Lee 2018). These debates speak to a reliance and rendition of traditional masculine and physical values in war.

Several of the taboos which had meant a general unease about woman soldiers on the battlefield had also extended albeit in a rather different way to female pilots. Much earlier in 1993, the exclusion of females from certain flying roles had been lifted and increasing numbers of women were recruited as drone operators. That number, for example in the US is still small but had increased to some 6% by 2019. Even as the position of the drone pilot in general may be depicted as lacking essential male characteristics, women drone pilots still are to be subject to certain types of gendered views.

Clark, for example has argues that the trauma experienced by Reaper drone crews is reported in a highly gendered manner and portrayed/constructed for woman as resulting from their personal failures and irrational emotionality. Clark utilized an innovative approach mixing fact with fictional accounts of the experiences of female drone pilots to make powerful points about the way biological traits and representations of motherhood may/do disadvantage women who seek to serve (Clark 2022).

Partis-Jennings has explored the masculinity of killing in Afghanistan through the trope of Hamlet (Partis-Jennings 2017). Could it be that drone combatants, still not recognized as equal to regular pilots, yet in high demand by the military, might yet provide further insights into how war will evolve: if so, will we see the acceptance of a 'heroic' drone technician? (Bayard de Volo 2016). Maybe so, as in the Ukraine War, we are just beginning to witness the lauding of a certain type of drone pilot. Those using drones to attack Russian convoys and storage depots have been labeled as 'heroes' for disrupting the Russian advance (Lee 2022).

8 Reflections: The Drone and the Home

Academic and policy debates over women, men, and war continues. Feminist scholarship continues to grow in strength and depth even as we struggle to make sense of the recent wars in the Middle East and contemplate the on-going tragedy of Russia's invasion of Ukraine. Interpreting the implications of any war is further complicated by the widespread incorporation of technologies such as surveillance and armed drones in conflicts across the globe. Death and injury (physical and mental) to those involved in the human business of war has not been vanquished, whatever the hopes of those such as President Obama who spoke of precision. Our contribution to this volume has indicated the importance of applying a gender lens to women, war, and technology (Verniers et al. 2022). No theater of war has accelerated the transformation of gender in combat and the use of drones as has the long war in Afghanistan. It is also the case that no stand-off weapon system has allowed gendered targeting of the enemy to the degree that drones have done. We are though keenly aware that we have only scratched the surface of debates over drone use. So let us end and perhaps begin by indicating further areas for interrogation.

9 Mundane War: Everyday Droning

Some important scholarship has highlighted the imperative of understanding the 'everyday.' There is now a welcome and burgeoning literature on this 'everyday' in the field of International Relations (Stanley and Jackson 2016). Emphasis is placed on how 'ordinary' people interpret, calibrate, and suffer from high-level politics; how humans

challenge, ignore but may be imprisoned by impositions of physical and political boundaries. In this respect the work of Jackman and Brickell provides something of an entry point into the idea of ‘everyday droning.’ Utilizing a feminist geopolitical analytic, drone geographies and feminist geopolitics (of home) have introduced the notion that everyday droning means a greater attention to the burgeoning range of actors that proliferate, mobilize, practice, experience, and become ‘subject’; to the drone: this, while recognizing the agency of the drone in everyday contexts (Jackman and Brickell 2021). If we think for example of the drone and the home the invasion of personal and political space as we described during night raids in Afghanistan we should note the intimacy of surveillance, intrusion, and killing.

But let us not ignore too, the centrality of drones to war. The Ukrainians have demanded an increase in the supply of drones from its friends and allies: such is the potency of the drone to national defense. Russia too, is seeking new sources for its own drone fleet: consolidating its alliance with Iran. While President Obama’s vision of drones as a cure all replacing battle has yet to be realized. Drones are proliferating.

And here’s the thing: even as we lament the current condition of women under Taliban rule might we/should we think of future possibilities in terms of war in that country. Ever since the advent of the rifle, the Pashtuns have endeavored to adopt whatever weapon system they possibly can in terms of increasing their capability to fight. Not being industrialized, they have developed a highly sophisticated capability to clone whatever weapon systems they can get hold of and that they like the look of. Adoption of new technology has therefore been limited by the ability to purchase or to reproduce. Because of this, the Taliban, like their 19th-century predecessors, have tended to use light weapons with an emphasis on accuracy and range to facilitate their advantage to exploit terrain for mobility or height. More recently they have adopted the latest communications equipment and night vision goggles to assist their form of insurgency warfare.

Reports indicate significant use of drones in support of the victory in 2021 and subsequently in dealing with the insurgency in the Panjshir Valley. It is likely that Taliban will continue to invest and develop this technology. However, mostly this will be achieved through purchasing and adapting equipment made by other countries. But any nascent technical capability is hampered by the exclusion of 50% from the workplace population in the form of females. Those Taliban who spent time in Qatar will know that even in that highly conservative country in terms of dress and gender mixing, women outperformed men in the science and technology field. It is possible that at some future stage, necessity will force Taliban leaders to emulate this example and a precedent set by Hazrat Aysha, the Prophet’s wife, who led men into battle, as a means of mobilizing females to support the war effort. It may seem fanciful, but the design, maintenance, and operation of drones would be a way of introducing women into combat roles without compromising ingrained cultural and religious interpretations on the segregation of the sexes. Can we envisage such a future?

Seminar Questions

1. How is it useful to look at drone technology through a gendered lens?
2. Why were women incorporated into COIN?
3. Does a society like that of Afghanistan complicate the business of intervention?
4. How do men and women relate differently to technology on the battlefield?
5. Do we now accept female ‘warriors’?
6. What is the future for women in war?

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7 Critiquing Drone Warfare

Abstract: Precision strike has assumed an outsized role in modern warfare. Within the First Drone Age, drone-based precision strike promises to deliver accurate, first-time hit percentages. Further, the prophets of precision strike and drone warfare assert that drone-based precision strike and precision strike-based strategies appear to offer a more civilized and antiseptic method of waging war. The marketing of precision strike, as well as how governments and militaries market it to the media and their domestic audience, foists the perceived benefits of precision strategies to the fore. Nonetheless, precision-based strategies, regardless of delivery platform, also come with serious shortfalls. To be sure, precision strategies often generate a set of counter-intuitive outcomes which are at odds with the availed benefits of precision strike munitions. The incongruence between benefit and outcome is referred to within this chapter as the Precision Paradox. The Precision Paradox is a cautionary heuristic to illustrate the potential shortcomings of precision strategies, thereby allowing decision-makers to incorporate a modicum of realism into their thinking. Further, the Precision Paradox also helps illustrate the need to return to military thought rooted in realism and reason, instead of military thought based on linear, best-case scenario suppositions.

Keywords: Precision paradox, drone warfare, revolution in military affairs, effects-based operations, precision warfare

1 Introduction

Many concepts dominate the history of warfare, but few ideas are as thematic as the pursuit of decisive battle. Since the time of the French Revolution to the present day, the pursuit of decisive battle has taken on mythical proportions as generals and armies attempt to emulate Napoleon Bonaparte's *pièce de résistance*, the battle of Austerlitz (Brauer and van Tuyll 2008, 119). However, the passage of time and technological improvement has advanced the idea of precision warfare to the point of competing with, if not surpassing, decisive battle's place of primacy in military thinking and strategy. While Bonaparte advocated the importance of battle to the outcome of war, today's policymakers, strategists, and practitioners make similar pronouncements regarding the importance of drone warfare, precision guided munitions (PGMs), and precision strike

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strategies. The 1991 Gulf War, in which the United States (US) and its allies routed a vapid Iraqi military, was modern precision strike's first real test (Browne 1991). During the Gulf War, PGMs accounted for roughly eight percent of expended munitions, but their wizardry accounted for nearly one hundred percent of the news coverage in the Western world (Mahnken 2011, 49).

Western military thinking and procurement in the post-Gulf War era, or what drone warfare enthusiast refer to as the First Drone Age, emblazoned with images and narratives of the PGM's accuracy in Iraq, gave rise to an age dominated by claims of precision strike's game changing potential (Mahnken 2011, 49). During this time, Western military thinking gravitated toward the belief that long-range and stand-off PGM use could circumvent land forces altogether, attack an enemy's cognitive center of gravity, and propel the enemy toward psychological paralysis (Warden 1995, 41–55). Psychological paralysis would prevent an adversary's ability to develop an effective military response and bring the US and its allies their own Austerlitz, but without the bloody mess of battles and large troop commitments (Warden 1995, 41–55). Precision strategy, moreover, would foster a new *Revolution in Military Affairs*, which the US would lead, and of which it, and its allies, would be the primary benefactor (Blaker 1997, 22). This period spurred precision-oriented warfighting concepts like *Rapid Dominance*, *Parallel Warfare*, Effects-Based Operations, and *Shock and Awe* (Freedman 2013, 214–220; Deptula 2001, 3–21).

Predictably, PGMs morphed from a niche capability in the early 1990s and into chic new warfighting stratagems by the late 1990s. In 1998's Kosovo War, US General Wesley Clark (2001, 116), NATO's Supreme Allied Commander Europe, recalls that land operations were out of the question. NATO instead employed an air-centric precision strategy in Kosovo. In a campaign almost exclusively fought from the air, US and NATO PGM usage in the Kosovo War reached 29%, which was an increase of 21% from the Gulf War (Mahnken 2011, 51). This trend continued in the intervening years. In 2001, the US invasion of Afghanistan registered 60% PGM usage (Mahnken 2011, 51). 2003's US invasion of Iraq witness PGM use top out at 68% (Mahnken 2011, 51). Armed drones and precision technology improved and became cheaper during the ensuing years, which further increased the diffusion of precision warfighting technology and the subsequent development of drone-heavy precision-oriented strategy (Bergen, Salyk-Virk, and Sterman 2020).

A significant problem exists with the precision strike theories of the First Drone Age. The most important of those shortcomings, and the focus here, is the absence of Conflict Realism in precision theory and strategy. Conflict Realism, as used herein, and not to be confused with International Relations' use of realism, is defined by the belief that war is a duel between competing actors, their warfighting systems, and each actor's base(s) of power. Further, Conflict Realism is defined by the belief that self-preservation is an actor's intrinsic motivation. Lastly, Conflict Realism is defined by the belief that an actor seeks continuous progress in relation to its condition and its regional and global competitors through goal-seeking behavior and a growth mind-

set. Conflict Realism's absence from precision theory and strategies is one of the leading causes for an idea referred to as the Precision Paradox.

Additionally, contemporary conflicts demonstrate that drones, PGMs, and precision strategies are not the antidote for warfare's moral and physical carnage. Scant evidence supports the precision advocate's claim that precision strategies win wars quickly, that they avert battle between land forces, or that precision strategies are less destructive than other warfighting approaches. Facts also fail to sustain the assertion that precision strategies require fewer salvos, fewer munitions, and lessen the logistics load more so than unguided options. The tension between aspirational theory and Conflict Realism permeates across post-9/11 wars in which drone warfare and precision strategies assumed an outsized role. The effect of the tension between precision's aspirational theory and realistic applications in warfare further accelerate the Precision Paradox.

The Precision Paradox demonstrates that collateral damage, physical destruction, and battlefield death are commensurable between the First Drone Age's PGM-based strategies and those that rely on unguided munitions. Further, the Precision Paradox illustrates that PGM accuracy does not inherently create effectiveness – a strike might hit its intended target; however, the strike is just as likely to fail at generating its intended effect on the target, despite first hit accuracy. This dynamic – *accurate, but ineffective* strikes – precipitates more strikes to bring about the intended outcome, not fewer. The *accurate, but ineffective* cycle – the Precision Paradox's élan vital – makes warfare more destructive and longer lasting, contrary to precision theory's proclamations of innocuous warfare and hastened wars. Lastly, the Precision Paradox's *accurate, but ineffective dynamic* creates the situation in which precision strategies quickly grind through PGM stocks, surpass industrial base production, and cause campaigns to slow to allow production to catch up, or the combatant uses unguided munitions to bridge the production gap. Nevertheless, the Precision Paradox, which sees precision theory turned on its head by Conflict Realism's impact on the praxis of warfare, results in drone warfare and precision-based wars taking the character of slow attritional grinds.

2 Purpose, Structure, and Methodology

The purpose of this chapter is to introduce the reader to the Precision Paradox. The Precision Paradox is a heuristic to help illustrate the limitations and counter-intuitive shortfalls of the First Drone Age's precision-based strategies. Though some of the Precision Paradox's features are seen in counter-terrorism strategies, the concept primarily emerges when precision strategies are central to large-scale, conventional warfighting. Further, drones and drone warfare play a part in the Precision Paradox, but they are not the heuristic's sole contributor.

This chapter begins by differentiating between war and warfare and highlighting where the Precision Paradox fits within armed conflict. Next, the introduction of several verities of war and warfare provide a needed injection of realism into the discussion to provide ballast to unrealistic and overly optimistic warfighting theories. These verities govern armed conflict and embody the general motivations and first order action of all strategic actors. Moreover, these verities form the divergent arc from which precision theory and strategy gives rise to the Precision Paradox.

The Precision Paradox consists of several features, the two most pertinent are examined within this chapter. First, the *accurate, but ineffective* metric must be applied to precision warfighting strategies. With that benchmark accounted for, precision strike does not reduce casualties or collateral damage in large-scale, conventional warfare. Both Russia and Ukraine's use of drones and precision strike in the ongoing Russo-Ukrainian War reinforce this point. At best, precision strike maintains the level of death and destruction that one would find in strategies underpinned by unguided strike support. However, what is more likely is that the negative environmental effects increase under precision strategies. When faced with persistent attack, for example, an actor's survival instinct commonly results in their movement to and from available fortifications. The pattern of *accurate, but ineffective* strikes recur until the initial effect on the target is achieved, or until that effect is no longer attainable. The recurrence of *accurate, but ineffective* strikes against a pragmatic enemy striving to persevere compounds precision's deleterious impact on the physical environment, creating a steady flow of civilian casualties, internally displaced persons (IDPs), and collateral damage (Fox 2020, 7–9). In more traditional forms of strike support, a less accurate but more effective salvo is applied, thus increasing the initial degree of death and destruction, but eliminating the target(s), thereby negating the need to give chase due to ineffective strikes (Fox 2020, 7–9).

Second, precision strategies do not provide a quicker, more economic method of waging war than those fought with unguided solutions. Further, the *accurate, but ineffective* cycle fuels exuberant PGM consumption as the aggressor chases survival-minded adversaries across the battlefield (Vershinin 2022). This chapter uses three case studies to help articulate the Precision Paradox's two central themes: the Syrian Civil War's battle of Raqqa, Operation Inherent Resolve's battle of Mosul, and the ongoing Russo-Ukraine War.

This chapter then concludes by asserting that Conflict Realism, not aspirational ideals, or unrealistic demands, must underwrite military thought. Military thinking founded on Conflict Realism allows policymakers, strategists, and practitioners to better prepare for the destructive rigors of warfare.

This chapter comes with two acknowledged limitations. First is the heavy reliance on US precision theory and usage. That over-reliance is due to the US's overarching lead in drone warfare and PGM use in modern warfare and not courtesy of a bias in favor of the US. Second, this chapter provides a heuristic (i.e., the Precision Paradox) based on theory that cannot be supported by quantifiable analysis. For instance, bat-

tles such as Raqqa or Mosul cannot be rewound, and the use of precision munitions replaced with unguided munitions to compare the variances between the two approaches. For this reason, the Precision Paradox is referred to as a heuristic, instead of a law in warfare.

3 Precision Warfare

War is a state of armed conflict between two or more strategic actors. In war, the combatants are state or non-state actors, and any variety therein. The term ‘strategic’ is relative to each actor and does not correlate to a state actor, or any other actor’s, participation in the international community. The Islamic State’s (ISIS) strategic level, for instance, differs greatly from that of a European nation-state.

Two forms of conflict exist: international armed conflict (IAC) and non-international armed conflict (NIAC). IAC is armed conflict between two (or more) state actors, whereas NIAC is armed conflict between multiple actors in which one (or more) is a non-state actor (ICRC 2012). International humanitarian law (IHL) governs both IAC and NIAC (ICRC 2012). The character of war – conventional, large-scale combat operations, or unconventional, irregular war – spans both IAC and NIAC.

Warfare, on the other hand, is a combatant’s application of its physical and non-physical weapons of war to overcome its adversary and achieve its strategic objectives. Warfighting concepts, such as Napoleon Bonaparte’s *manoeuvre sur les derrières*, B.H. Liddell Hart’s *indirect approach*, or World War II Germany’s *blitzkrieg* exemplify warfare. Drone warfare and precision warfare are two of the newest forms of warfare to emerge.

Both drone and precision warfare pervade IAC and NIAC. Further, drone and precision warfare are applicable across the spectrum of conflict – from high intensity large-scale combat operations to terrorist hunting in lower intensity conflict. Often thought of as drone-centric, precision warfare harnesses all forms of precision strike systems.

The pursuit of precision, in plain language, is the quest for accuracy. Accuracy’s importance is not an end unto itself, but instead, it is sought-after because of financial prudence (Brauer and van Tuyll 2008, 122–132). Limited resources constrain all strategic actors, making them prone to quick culmination if those resources are not judiciously managed. To be sure, Andrew Krepinevich (2002, 34–38) asserts that efficiency-oriented equipment, organizations, and methods of operating reflect limited resources.

Precision theory asserts that accurate weapons systems, employing stand-off, reduces the number of rounds required to kill or destroy a target (Blaker 1997, 23). Further, accurate weapons theoretically rouse deft tactical action and consequently hasten battlefield victory (Deptula 2001, 11–13). Additionally, theorists posit that accurate weapons diminish the strain on an actor’s logistics tail (Blaker 1997, 23–24).

In recent decades, however, humanist perspectives assumed equal, if not greater importance in warfare than fiscal conservatism. The international community's endorsement of proportionality, military necessity, discrimination, and preventing undue suffering in warfare reflects this change in attitude (Schmitt 2005, 462–460). Moreover, the adoption of doctrines, techniques, and training that incorporate IHL are visible demonstrations of this commitment.

Modern precision strategies, to include those of the US and its allies, fall within this context of warfare. Modern precision strategies in the First Drone Age use long- and close-range precision weapons systems to support IHL and resource considerations (Watts 2013, 3–4). Additionally, actors use stand-off and smaller land forces to make themselves hard to detect and more challenging to engage (Edwards 2004, 84–85).

4 Realist Verities of War and Warfare

Theorists and practitioners alike construct verities or expand on existing principles of armed conflict to support their theories and concepts, which is why names such as Sun Tzu, Carl von Clausewitz, J.F.C. Fuller, and Trevor Dupuy resonate today. Interpretations of warfare assume many different hues, from futurist to determinist. Nevertheless, the verities articulated below, and the corresponding themes throughout this chapter, are a Conflict Realist interpretation of war and warfare.

From the macro-level, the verities subscribe to the belief that armed conflict is the struggle between multiple actors, and dynamic and adaptive warfighting systems animate those actors. The actors' dynamic and adaptive systems grapple for primacy with one another, attempt to subjugate the adversary, and work to exhaust the adversary's system, while preventing their own system from becoming exhausted. The verities are:

- Verity 1: War is a competition between two or more actors and each actor's open system. (Fox 2021, 6)
- Verity 2: All systems in war are open systems, meaning that they sense, reflect, and adapt (i.e., learn) and allow actors to recover from mistakes and modify their actions based on the situation. (Fox 2021, 7)
- Verity 3: Self-preservation is the highest policy objective for any actor in war and the first rule for any military or fighting force engaged in warfare. (Fox 2021, 7)
- Verity 4: Through feedback loops, information fuses a system and makes it operate as designed. (Fox 2021, 7)
- Verity 5: All actors will pursue continuity in war as a first order principle – that is, the system will place its own welfare and fitness alongside accomplishing its mission. (Fox 2021, 7)

- Verity 6: All actors will maintain their system's welfare by killing off any dead, dying, or over-burdensome elements within it. (Fox 2021, 7)
- Verity 7: In war and warfare, a strategic actor will not intentionally operate in a way that makes it vulnerable to quick, decisive defeat. (Fox 2021, 7)
- Verity 8: All actors will energetically work to avoid existential crisis. (Fox 2021, 7)
- Verity 9: An actor will not fight in ways in which its adversary wishes it to fight. (Fox 2021, 7)
- Verity 10: All warfighting concepts and doctrines are wrong, but some are more wrong than others.

These verities guide the interaction between strategic actors engaged in armed conflict and are germane to both seeing and understanding the Precision Paradox. The following case studies further describe the Precision Paradox.

5 Case Studies in the Precision Paradox

The Precision Paradox is the manifestation of suboptimal and unintended outcomes associated with precision warfare strategies (Fox 2020, 7). The Precision Paradox's suboptimalization arises from the incongruence between aspirational, unrealistic precision warfare theories and the praxis of armed conflict. This situation arises because precision thinking heavily relies on linear and optimum scenarios in its development process, while failing to account for Conflict Realism through the incorporation of a motivated and resourced opponent who is capable of learning and adaptation. The Precision Paradox provides several unique features for investigation; however, this chapter limits its focus to two of the concept's salient components: civilian casualties and collateral damage, and the financial costs of precision strategies.

A common refrain among precision advocates is that precision strategies and PGM use reduces civilian casualties and limits damage to civilian infrastructure (United States Air Force n.d., 11). This tends to be more factual in counter-terrorism situations, but in large-scale combat operations reality tells a different story. Challenging the orthodoxy of precision, Abagail Watson and Alasdair McKay (2021) assert that the use of drones and other weapons systems that provide distantly delivered PGMs prevent an attacking force's ability to implement useful civilian protection mechanisms. Civilian deaths and damage to infrastructure, as a result, do not decrease, but paradoxically increase with the use of drones and other remote attack systems (Watson and McKay 2021).

Additionally, precision enthusiasts argue that PGM usage is more economical than unguided precision strategies and that they hasten the end of war (Perry 1997). Armed conflict in the First Drone Age does not support this assertion. Operation Inherent Resolve's drone and precision strike-rich battles of Mosul and Raqqa, for in-

stance, each took several months to conclude. Raqqa lasted nearly five months, while Mosul persisted for almost ten months. To put Mosul's duration into historical context, World War I's battle of Verdun, one of that war's signature battles, also lasted nearly ten months, and was dominated by its era's precision strike capability – observed, indirect fire. Historian Cathal Nolan (2017, 370) attributes much of Verdun's high casualties and collateral damage to the density of people in relation to the battlefield, which was also a driving force for the death and destruction exacted on Mosul (and Raqqa).

Armed conflict in the post-9/11 period supports the Precision Paradox. This chapter uses three case studies from this era to shed light on the concept. The case studies include the Syrian Civil War's battle of Raqqa, the ongoing Russo-Ukrainian War, and Operation Inherent Resolve's battle of Mosul.

5.1 The Battle of Raqqa

In Raqqa, ISIS operated among the city's civilian populace, used its inhabitants as human shields, and used civilian infrastructure for protection and basing (McNerney et al. 2022, 47–50). This should not come as a surprise because as Michael Schmitt (2005, 466) asserts, "When precision capabilities are possessed unequally on the battlefield, the resulting asymmetry may lead the disadvantaged side to resort to tactics that violate the most basic principles of international humanitarian law." By operating in this manner, ISIS confounded US and coalition attempts to adhere to IHL (Watson and McKay 2021). Specifically, ISIS's tactics made the US and coalition's use of drones, remote targeting identification, and discerning ISIS fighters from civilians on the battlefield extremely challenging (McNerney et al. 2022, 91).

Further, the US and coalition's use of proxies in close contact with ISIS did not improve the target identification process, which had the second order effect of increasing, not reducing, civilian casualties and damage to infrastructure (McNerney et al. 2022, 91). Seconding the weakness of the US's counter-ISIS strategy, RAND states that, "By choosing to conduct the Raqqa operation with a very limited ground presence and a high reliance on the SDF, the United States effectively shifted risk from US military personnel to the civilian population of Raqqa" (McNerney et al. 2022, 91). As a result, the use of PGMs did little to minimize civilian harm during the battle (Amnesty International 2017c, 60–65).

5.2 Russo-Ukrainian War

The Russo-Ukrainian War provides a state actor-on-state actor example of the Precision Paradox, whereas Raqqa and Mosul do not. Russia's use of PGMs during the 2022 Russo-Ukrainian War demonstrates scant difference than its use of unguided munitions. Russian military tactics in Ukraine, which focuses on flattening cities and ter-

rorizing civilians, is the primary contributing factor to this situation (Ismay 2022). Strikes on a maternity hospital in Mariupol (March 9, 2022), an attack on a busy train station in Kramatorsk (April 8, 2022), a strike on a packed shopping mall in Kremenchuk (June 27, 2022) and strikes on a hotel and apartment building in Odesa (July 1, 2022) are examples of how Russia uses precision to terrorize civilians (Victor and Nechepurenko 2022).

Russia's pitiless siege tactics and indifference for IHL has resulted in 11,544 civilian casualties, which includes 5,024 civilian deaths (United Nations Human Rights Office of the High Commissioner 2022a). Russia's disregard for the humanitarian situation in Ukraine has also generated seven million IDPs and nearly six million refugees (United Nations Human Rights Office of the High Commissioner 2022b). Russia's brutality, underpinned by PGMs, resulted in many classifying Russia's actions in Ukraine as war crimes (Human Rights Watch 2022; Office of the Commissioner United Nations Human Rights 2022; Bose 2022).

PGM consumption is wreaking havoc on all the participants, both active and passive players, and their respective war stocks and industrial bases (Sonnenfeld et al. 2022, 51–53). Ukraine, who's own supply is greatly enhanced by contributions from Western nations, is churning through precision munitions at a prodigious rate (Schmitt and Barnes 2022). That problem became more pronounced as Russian forces adapted from early Ukrainian success, which was the result, among other things, of drone-launched PGMs tank-plinking their way to victory in Kyiv and Kharkiv (Watling 2022).

On the other side of the conflict, brutish operations and terror tactics erode Russia's PGM supply (Applebaum 2022). Economic sanctions chasten Russia's ability to import the required components to produce PGMs, challenging Moscow's ability to replace battlefield expenditures (Byrne et al. 2022, 5). The theft of washing machines and other domestic products by Russian soldiers in Ukraine during the spring of 2022 is symptomatic of the sanctions' impact on PGM production (Detsch 2022). Pilfered products were shipped back to Russia not for personal benefit, but to help Russian industry offset material shortcomings stifling PGM production (Byrne et al. 2022, 15–18). The situation was so dire for Moscow that in July 2022, Russian President Vladimir Putin turned to Iran for assistance overcoming its PGM deficit (Karimi and Isachenkov 2022). Douglas Barrie and Joseph Dempsey (2022) summarize Precision Paradox-associated challenges presented by precision strategies by stating, "The intensity and duration of the Ukraine conflict, and Russia's apparent stockpile issues, will be posing questions for other defense ministries as they reassess their own assumptions on precision weapons stocks and the industrial capacity to replenish them."

Further, Alex Vershinin offers wise counsel regarding IAC and precision strategies. Vershinin (2022) posits that the Russo-Ukrainian War wrecked precision strikes' *one-shot, one-kill* hypothesis, especially as it pertains to large-scale combat operations. Modern militaries are not fragile entities susceptible to defeat in a single decisive strike, like Prussia's victory over Austria at Köninggrätz in 1866. Rather, modern militaries reflect an actor's adaptive, robust, and redundant system, which pursues both

self-preservation and self-interest, during armed conflict. Because of each actor's systemic character, strategic victory in armed conflict today requires inordinate, and unknown, amounts of war materiel (Vershinin 2022).

5.3 The Battle of Mosul

Operation Inherent Resolve's battle of Mosul provides an instructive example for how drone-laden precision strategies in large-scale combat operations fuel the Precision Paradox. Between October 2016 and July 2017, the combined effect of combat between the US, its coalition, and the Iraqis on one side, and ISIS on the other, milled the city of Mosul. Statistics reveal that the battle reduced the city's population from two million inhabitants to 700,000 people, and created 900,000 IDPs (Jalabi and Georgy 2018). The battle, in which all sides sought to both survive and win, destroyed over 40,000 homes, generated more than ten million tons of rubble, and left Iraq with a $2 billion reconstruction bill (Jalabi and Georgy 2018). In hindsight, the nine-month battle is more reminiscent of the hardships of urban warfighting in WWII than of high-tech modern warfare.

The US Department of Defense suggests that civilian deaths during the battle range between 320 and 1,400. Several non-government organizations (NGOs), on the other hand, state that the number of civilian deaths ranges between 10,000–11,000 (Amnesty International 2017b). Many of these NGOs state their civilian death calculations are the direct result of coalition and Iraqi strikes, and not the result of the combined effect of all the combatants' activity (Amnesty International 2017b). The *New York Times*, for instance, expounds on the battle's high death toll in a 2021 exposé. The *New York Times*'s Azmat Khan (2021) emphatically asserts that poor intelligence, hasty targeting, and the demand for results, more so than anything else, doomed the US's drone-dominated precision strike strategy in Mosul to high civilian casualties, massive IDPs, and momentous damage to infrastructure.

Taking a step back, why did the US's progressive precision strategy fail to deliver on the concept's theoretical promises? ISIS's basic desire to survive is the first contributing factor to that unraveling, and the primary catalyst for Mosul's high civilian casualties and extensive collateral damage. The desire to survive should come as no surprise when considering basic systems theory and applying a realist's eye to conflict studies. To be sure, French theorist Ardant du Picq (1987, 77) writes that, "Man in battle [. . .] is a being in whom the instinct of self-preservation dominates at certain moments, all other sentiments." Russian military theorist Alexander Svechin (1991, 248) echoes du Picq, asserting that the first principle in warfare is to insulate oneself against a quick and decisive enemy attack.

ISIS used a variety of tactics, like those they used in Raqqa, in pursuit of self-preservation. ISIS's priority tactic was the avoidance of US, coalition, and Iraqi reconnaissance systems and to confound targeting processes (Flood 2018, 30–34). Tunneling

from structure to structure in Mosul was one way that ISIS fighters sought to sidestep reconnaissance and targeting (Flood 2018, 30–34). When PGM strikes were *accurate, but unsuccessful*, ISIS fighters stayed mobile and absconded from the damaged structure to other buildings in the vicinity (Lamonthe et al. 2017). ISIS's repositioning drove a new targeting cycle and additional precision strikes (Wasser et al. 2021, 248–252).

The iterative character of combat between ISIS and the counter-ISIS forces took the form of a classic *challenge-response cycle*. *Challenge-response cycles* are realist reflections of combat in an adversarial context, which break from monochrome linear theories, like those that dominate precision theory, and demonstrate the true struggle of warfare. *Challenge-response cycles* occur at the micro-level (i.e., that of discrete human activity), at the macro-level (i.e., that of strategic actor interaction), and all levels of social organization in between. In any instance, the *challenge-response cycle* continues until one actor either achieves its objective, or it cannot continue competing, and thus, removes itself from the conflict.

Moving from theory to practice, the *challenge-response cycle* is visible in Mosul through the US and coalition's methodical chase of ISIS with incessant PGM strikes in support of Iraqi land forces. Despite the US and coalition's best intensions, ISIS's eagerness to survive and win in the face of overwhelming odds resulted in US and coalition PGMs, in conjunction with Iraqi land force operations, tearing Mosul apart as they chased ISIS through the city (Lamonthe et al. 2017).

ISIS use of human shields and forcible civilian relocations to hot spots on the battlefield is another example of the *challenge-response cycle* eroding precision strike's effectiveness and fueling the Precision Paradox. The principle of proximity and density dictates that a high proportion of civilians on a battlefield will create a correspondingly high proportion of civilian casualties and collateral damage, regardless of the tactics or munitions used (Nolan 2017, 370). Thus, ISIS presumably used human shields and forced relocations to:

– Protect its own forces by confusing US and coalition reconnaissance, targeting, and precision strike
– Maintain a civilian attrition zone to reduce its own personnel losses
– Deter US and coalition attacks (land and air) out of caution for creating civilian casualties
– Provide an early warning system
– Use civilian casualties and its associated infrastructure damage to generate enmity towards the US-led coalition and Iraqi security forces

Viewed collectively, ISIS's use of human shields and forced relocations – the response to the challenge provided by the counter-ISIS forces – accelerated civilian casualties and collateral damage in Mosul (Amnesty International 2017a, 43–44).

Bad tactics, such as 'morale strikes' and 'roof knocking,' exacerbated the destructive effects of the *challenge-response cycle*, and thus also contributed to the Precision Paradox. The Iraqi security forces, for example, displayed a keen unwillingness to ad-

vance in the face of stalwart ISIS resistance. US and coalition forces used morale strikes – attacks on unimportant objects to demonstrate air support's presence – to inspire the Iraqis and compel them to continue advancing (Wasser et al. 2021, 92–109). Morale strikes' contribution to civilian casualties and collateral damage in Mosul is unknown, but it certainly contributed to the wave of inefficiency and destruction that swept through the city (Fox 2020, 8).

Roof knocking, another example of bad tactics, is the practice of firing a PGM over a target and detonating the munition overhead. The airburst is intended as a 'knock' which is supposed to spur a building's inhabitants to vacate the facility (Wasser et al. 2021, 231–232). Shortly after the knock, a salvo of PGMs follow to eliminate the target (Taylor 2016). Roof knocking in Mosul proved ineffective, wasteful, and destructive because it failed to work, used more munitions when less were required, and created undue damage (Taylor 2016).

To conclude this case study, open-source information lacks the fidelity to parse the true distinction between which actor bears responsibility for the significant number of civilian casualties and collateral damage in Mosul (Wasser et al. 2021, 169). Nevertheless, the US's much ballyhooed precision strategy and precision strike capabilities failed to live up to their hype in Mosul. The *challenge-response cycle*, ISIS's unwillingness to be easily and quickly defeated, the Iraqi security forces reluctance to advance in combat, and questionable US and coalition tactics, all contributed to derail the US and coalition's linear precision strategy in Mosul. That strategy fueled paradoxical effects that allowed precision strike to significantly contribute to the creeping wave of attrition in Mosul that disemboweled the city one human life and one man-made structure at a time.

Surprisingly, the US Army acknowledges the limitations of its precision strategy in Mosul. The US Army's Mosul Study Group (2017, 57), a small organization assembled by the US Army's Training and Doctrine Command to distill lessons learn from the battle, asserts that:

> In Mosul, the destruction of physical terrain did not necessarily equate to comparable effects against personnel or communication nodes. Munition choices in Mosul, amplified by the structural density of the city, were not always proportional to the intended effects on the enemy and, when combined with rules of engagement considerations, on collateral damage. Even when considering overpressure and blast waves from these rounds, ISIS fighters were forced from their defensive positions by shrapnel or direct fire weapon systems, rather than blast effects.

6 Analysis

Inefficiency is an inherent flaw within precision warfare theory and consequently, inefficiency is one of the driving forces behind the Precision Paradox. Precision warfare's theory is built on a *one-shot, one-kill* methodology. Yet, Prussian military theorist Carl von Clausewitz (1984, 78) cautions against such unrealistic and linear thinking by stat-

ing that, "Man and his affairs, however, are always something short of perfect and will never quite achieve the absolute best."

Clausewitz correctly points out that inefficiency always destabilizes idealistic pursuits of perfection, to which precision warfare theory subscribes. Most precision theory and strategies conflate accuracy with efficiency, and thus bake a critical pitfall into their thinking. However, the reality of the situation is that high percentage hit rates (i.e., accuracy) does not guarantee a high percentage success rate (i.e., efficiency). To put it another way, accuracy does not equal efficiency, and this inefficiency bungles many of precision's promises.

Inefficient strikes are counterproductive. Recalling the *challenge-response cycle* seen in Mosul, an accurate strike that does not destroy the target, or a strike that fails to achieve its desired effect, causes the aggressor to re-engage until they achieve their preferred outcome. As the cycle continues, the area and the people touched by each strike's destructive power grows. At the macro-level, the Precision Paradox peaks when the simultaneous cycling of accurate, but ineffective strikes occur at multiple points of contact and along multiple fronts, accelerating the number of civilian casualties, collateral damage, and PGM consumption (Fox 2020, 7–9).

Next, precision advocates assert that precision strategies hasten the duration of war, which in turn, reduces the precisionist's financial stress and strain of warfighting (Perry 1997). However, survival instincts and self-interested action unravel precision theory's *one-shot, one-kill* methodology, resulting in higher, not lower, munition consumption and associated logistics costs (Blaker 1997, 23–24).

For instance, Gulf War analysts found that the use of one ton of PGMs in Iraq replaced 12–20 tons of unguided munitions and saved the US 40 tons of fuel per ton of PGM delivered (Watts 2013, 8). The Gulf War, however, only represents one data point in the precision warfare era. The post-Gulf War era sees quantitatively higher PGM usage, and this period demonstrates that high first strike hit percentages does not equate to *effective* strikes, nor do high first strike hit percentages correlate to fiscally responsible warfighting strategies (Pietrucha 2015). A team of analysts at RAND came to a similar conclusion and offer three recommendations to remedy these Precision Paradox-related challenges. First, the West must revamp targeting processes to make it more efficient (Wasser et al. 2021, 306–307). Second, the West must modify how it allocates high-demand (i.e., PGM) assets (Wasser et al. 2021, 306–307). Third, the West must develop useful ways to incorporate unguided munitions to offset PGM depletion (Wasser et al. 2021, 306–307). Finally, the West must develop doctrines better suited for PGM employment in urban terrain (Wasser et al. 2021, 306–307).

7 Conclusion

The Precision Paradox is both a cautionary tale and a self-correction mechanism. The Precision Paradox provides notice that military thinking must move beyond fanciful beliefs in unproven and historically inaccurate postulates about technology and warfare. Modern drone enthusiasts, such as James Rogers, are taking notice. Rogers (2017) cautions that as the US loses agency as both a drone and precision hegemon, drone-driven atrocities will likely increase.

The Precision Paradox rises from precision theories and strategies lacking a requisite degree of realism. Napoleonic theorist Antoine Jomini notes that this is not a new challenge in the practice of warfare, stating, “Correct theories, founded upon right principles, sustained by actual events of war, and added to accurate military history, will form a true school of instruction for generals” (Jomini 1987, 556). British theorist J.F.C. Fuller echoes Jomini by stating that, “Method creates doctrine, and a common doctrine is the cement which holds an army together [. . .] we want the best cement, and we shall never get it unless we can analyze war scientifically and discover its values” (Fuller 1926, 35). Clausewitz offers perhaps the most apropos, and well-known, argument for realism in military thought, positing that warfare is a human endeavor, and as a result, fog, friction, and chance will always impact even the most meticulous plans (Clausewitz 1984, 101).

To help overcome the Precision Paradox in future warfare, Conflict Realism must be the cornerstone for military thinking – from conceptual work to doctrines, to policy and strategy, and tactical plans. Conflict Realism, reflected in contemporary discourse on urban warfare, sieges, and proxy war, is creeping back into military thought based on the shortcomings of precision-based strategies in the post-9/11 wars. Conflict Realist military thinking possesses sufficient humility to cede that warfare is fraught with limiting factors, imperfect execution, and human and machine error. Conflict Realism does not discredit those shortfalls, nor posit that technology will provide the means to jet beyond those limitations. Instead, Conflict Realists accept those constraining forces as limitations on the realm of what’s possible in warfare and incorporates them as integral components of military thought.

Military thinking must move beyond the pursuit of the modern-day equivalent of ‘decisive battle’ through unrealistic precision strategies. Modern actors, embodied by dynamic systems, are too redundant and robust for such an approach to work. Instead, modern, and future military thinking must possess realist verities of war and warfare, account for the *challenge-response* cycle, and move beyond the unrealistic belief that *one-shot, one-kill* theories are truly viable. The failure to do so will perpetuate the Precision Paradox and its devastating battlefield effects.

Seminar Questions

1. How has drone warfare and precision-based strategies changed armed conflict?
2. How has drone warfare and precision-based strategies impacted arms production? Does this change in production keep pace with requirements, as demonstrated in Ukraine, Syria, and Iraq?
3. Given an idealist perspective, how does the First Drone Age set the stage for the Second Drone Age? What does the character of warfare look like in this environment?
4. Given a Conflict Realist perspective, how does the First Drone Age set the stage for the Second Drone Age? What does the character of warfare look like in this environment?
5. How does your perspective of drone warfare and armed conflict align or diverge with your answers to questions 3 and 4?

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Part 2: **The First Drone Age**

Sarah Kreps

8 What Is ‘The First Drone Age’?

Abstract: In the First Drone Age, the United States pioneered the use of unmanned aerial vehicles, or drones, for counterterrorism strike. The sheer breadth and volume of those strikes prompted criticism about both the United States’ use of drones but sparked concerns about proliferation. However, the United States’ use required an extensive array of infrastructure that is unique to itself and other countries that acquire drones have not been able to replicate the US model. As countries other than the US increasingly use drones in warfare in new ways, scholarly and policy analysis of the practice should keep pace.

Keywords: First drone age, proliferation, counterterrorism

On November 3, 2002, the United States used an MQ-1 Predator to strike Islamist militants in Yemen. The day did not mark the first drone strike, as the United States had deployed Predators to Afghanistan in October 2001 in response to the 9/11 attacks. But Afghanistan was considered an area of ongoing conflict, having received both domestic and international authorization for the use of force. In contrast, the strike in Yemen had no explicit legal authorization but rather was conducted as a CIA operation, killing the individual suspected of planning the terrorist attack in 2000 that killed 17 American soldiers, as well as a handful of other individuals, including an American citizen (New America 2023).

This type of strike – outside the context of an ongoing conflict, without legal authorization, and incurring civilian casualties – was emblematic of what James Rogers has referred to as the First Drone Age, in which the United States largely had a monopoly over the use of armed drones, and other countries had not yet acquired drones (2021). What is increasingly evident especially in retrospect is that the American use of drones was highly idiosyncratic. Critics during this First Drone Age had cautioned that these counterterrorism drone strikes were destabilizing because the United States was conducting hundreds of drone strikes in countries such as Pakistan with whom the United States was not at war, raising both international legal questions about the recourse to force but also accountability questions about the domestic legal basis of these strikes that were an awkward combination of visible and overt but officially undisclosed and covert. Proliferation, according to these arguments, would be problematic because if other countries used drones in these same ways, regional instability would be the consequence (Kreps and Zenko 2014).

These arguments, however, conflated the visible use case of the United States with how other countries could or would plausibly use the same technologies. At least two factors made the United States’ use of drones for counterterrorism distinctive and an unlikely path for other countries to emulate. One difference is that the First Drone

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Age arose in response to an unprecedented attack on American soil. The United States had had Predators in the 1990s but elected not to arm them until 9/11, which precipitated an expansive counterterrorism campaign unlike it had ever experienced. In this campaign, the United States relied on murky legal authority, whether self-defense, Article 2, or the post-9/11 authorization for the use of force, to carry out strikes, but the key feature of drones was that it did not require boots on the ground, which would have been costly and necessitated domestic debate that was largely absent. The consequence, as some critics have pointed out, is that the United States used drones far more frequently than had domestic debate been required or had Americans been confronted directly with the costs of war in the form of body bags coming home from war (Kaag and Kreps 2014). These were a distinctly American set of circumstances that other countries are unlikely to face.

The most significant difference between the United States' use and other countries is the capacious global infrastructure underlying these strikes. The United States has relied on an extensive array not just of military bases in the Middle East and Southwest Asia for basing its drones (Kreps and Lushenko 2021), but also overhead satellites, undersea cables, and bases in Europe for the communications required to operate these drones (Scahill 2015). No other country has this infrastructure, meaning that no other country can conduct global strikes even if they had the Reaper hardware. Even the UK and France, which have armed Reapers, have had to restrict their drone strikes to regional targets in the Middle East or Sahel in Africa, where they have proximate bases (Rogers and Goxho 2023).

As Fuhrmann, Horowitz, and Kreps (2016) point out, context matters. Drones have been gamechangers in the context of American counterterrorism strikes that brought drones into the international public consciousness in 2001. They were effective (Byman 2013) if overreaching in that context, being used to target suspected terrorists in ways that, especially in the beginning, were cavalier and associated with high levels of civilian casualties as opposed to the higher thresholds of evidence required for later strikes (Kreps, Lushenko, and Raman 2022). Further, drones may have been associated with a frequency and geographic distribution of force more significant than had manned platforms or boots on the ground been required (Kreps and Zenko 2014), but the argument that drones have lowered the threshold for using force simply does not apply in most other contexts. Indeed, both theoretically and in practice, states using drones in intrastate conflict use drones as just another platform and have not initiated or used drones as a standalone, as the United States had done, but rather in conjunction with other ground or air forces.

For example, countries such as Nigeria have acquired Chinese-made armed drones that they deployed as part of an ongoing counter-insurgency operation (Bisht 2020). In 2015, Pakistan acknowledged its first armed drone strike against the Pakistani Taliban and affiliated terrorist groups, but again, these are groups that Pakistan had been fighting for years and the drones did not lower the threshold for using force but rather became another tool in the toolkit (Ansari 2015). Armenia and Azerbaijan have been

involved in conflict since the 1990s, but only in 2020, Azerbaijan used recently acquired drones to strike vehicles and troops. Azerbaijan had acquired the Bayraktar TB-2, a medium altitude, long endurance drone, made in Turkey. Ukraine has also used the TB-2 against Russia as a way to target Russian assets especially in the early months of the war when convoys were stuck in the mud.

Beyond Azerbaijan and Ukraine, countries such as Nigeria, Morocco, Libya, and Ethiopia have acquired the TB-2. Selçuk Bayraktar, whose company makes the TB-2, came of age as an engineer when the US was using the Predator to strike in Afghanistan and Iraq. While he criticized US foreign policy for its reliance on armed drones, he was drawn to the idea of autonomy and precision and went back to Turkey and sought to emulate the technology (see chapter by James Patton Rogers). The result was a technology that offered countries a drone similar to the Predator but at a fraction of the cost (Witt 2022).

During the First Drone Age, armed drones went from a mere military consideration to a near imperative. The United States conducted hundreds of counterterrorism strikes across the globe, leading to frenzied calls for tight prohibitions on the transfer of this technology to other countries lest they emulate the experience. While others argued that the US use of drones in the First Drone Age would set worrying norms for future use by other nations, these concerns have not played out in reality. Indeed, the proliferation of armed drones, albeit somewhat less capacious such as Chinese-made or Turkish-made TB-2s, has not led to lower thresholds for war, but rather new capabilities that allow these countries to fight wars with more precision. The experiences of the First Drone Age, in other words, do not port over directly to the world of proliferation, suggesting clear limits to the insights, lessons, and warnings of the United States' experience and a need to study and draw new conclusions about the new contexts in which drones are being used.

Seminar Questions

1. What is the First Drone Age and when did it start?
2. What were some of the criticisms about the use of drones in the First Drone Age?
3. Why have countries other than the US sought to acquire drones?
4. How are other countries using drones and why is this use different from the First Drone Age?
5. What were the limits to other countries emulating the model of the First Drone Age?

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Madeleine Rauch and Shahzad Ansari

9 Drone Pilots: The Struggles of War by Remote Control

Abstract: Technologies are known to alter social structures in the workplace, reconfigure roles and relationships, and disrupt status hierarchies. However, less attention has been given to how a technology disrupts the meaning and moral values that tether people to their work and render it meaningful. To understand how workers respond to such a technology, we undertook an inductive study of military personnel working in unmanned aerial vehicles, or drone operations, for the U.S. Air Force. We draw on multiple data sources, including personal diaries kept by personnel involved in drone operations. Our analysis suggests that drone technology has revolutionized warfare by (1) creating distanciated intimacy, (2) dissolving traditional spatio-temporal boundaries between work and personal life, and (3) redefining the legal and moral parameters of work. Drone program workers identified with these changes to their working environment in contradictory ways, which evoked emotional ambivalence about whether it was morally right and wrong. We illuminate how workers cope with such ambivalence when a technology transforms the meaning and morality of their work. We extend theory by showing that workers' responses to a changed working environment as a result of a remote technology are not just based on how the technology changes workers' tasks, roles, and status, but also on how it affects their moral values.

Keywords: Technology, drones, emotional ambivalence, emotions, moral emotions, war

1 Introduction and Motivation

> It is forbidden to kill; therefore, all murderers are punished unless they kill in large numbers and to the sound of trumpets. (Voltaire)

Emerging technologies can occasion significant transformations in work, disrupt social structures and status hierarchies in the workplace, and alter the boundaries of expert authority (Barley 1986, 1990; Barley, Bechky, and Milliken 2017; Barley and Kunda 2001; Barrett et al. 2012). However, emerging technologies that redefine the entire context of work may also disrupt the moral values that tether people to their work and render it meaningful. When these values no longer provide guidance in this "new normal," workers become unsure about how to act appropriately or who they should be (Petriglieri, Ashford, and Wrzesniewski 2019). This may be particularly in organizations, where workers "over-identify" with their work and hold their profes-

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sional values sacred (Elsbach 1999), even regarding their work as a "calling" (Bunderson and Thompson 2009).

While studies have shown that changes to deeply held values of work lead people to respond in different ways to emerging technologies (e.g., forensic scientists responding to DNA technology), we still have only a limited understanding of how workers respond emotionally. In highly regulated "masculine" organizational contexts characterized by strong "feeling rules," toughness, self-reliance, and a preference for rationality over emotionality (Kunda 2006; O'Neill and Rothbard 2017), workers have little organizational support to vent or share their feelings and to adjust collectively to the new norms of work.

To understand how workers experience and respond to emerging technologies that disrupt the sacred meaning and values of work in contexts with strong "feeling rules," we conducted an inductive study of military personnel operating unmanned aerial vehicles (UAVs) for the U.S. Air Force. Drone technology has revolutionized conventional warfare by replacing costly invasion of foreign territories with surgical attacks conducted remotely on selected targets (Schwarz 2018). While the technology is regarded as morally justifiable for enabling a "virtuous" war (Boyle 2015), it is also morally contentious. It thus provides an ideal basis for studying workers' affective responses to an emerging technology. Our analysis reveals three key characteristics of the technology; remote-split operations, remote piloting of unmanned vehicles, and interaction through iconic representations that allow (1) "distanciated intimacy," (2) dissolve traditional spatial and temporal boundaries between professional and civilian life, and (3) redefine the moral and legal parameters of work. We explain how the technology creates conflicting feelings, and how service members – both experienced and new recruits – respond in different ways to the new technology. In some organizations little to no organizational support is provided to help people deal with their emotions. So, if such organizations provide no support for their employees to form new meaning and values collectively, how may these individuals respond to the strong emotions created by a new technology?

To address this issue, we draw on an inductive approach to study individuals in an organizational setting in which an emerging technology has revolutionized modern warfare: the Unmanned Combat Aerial Vehicles (UCAV) program of the United States Air Force. Our primary data source draws on 43 personal diaries kept by military professionals working for the UCAV program. We complemented these diaries with interviews, ethnographical observations, and archival documents. The U.S. Air Force is the "aerial and space warfare service branch" of the U.S. Armed Forces, which forms part of the Department of the Air Force and belongs to the Department of Defense.

Our principal data set comprises the personal diaries of individuals working on the drone program in the Air Force. We also conducted 43 interviews with the diarists to understand their experiences, asked follow-up questions to explore what they had written in their diaries, conducted ethnographical observation in the field, and studied in-

ternal documents. We conducted ethnographical observation through visits to a military base in the U.S., to get a feel for the situation in which these diaries were written (see Rauch and Ansari 2022 for more details) and studied more than 2,927 documents, including annual reports, pre-deployment information, mission briefings, reports on preventing post-traumatic stress disorder (PTSD), and redacted dissertations written by military personnel. We also examined reports covering the legal and ethical aspects such as on the principles, standards, and procedures for authorizing drone warfare. In the military, there is dislike of the word "drone," and the term "unmanned RPAs" (remotely piloted aircraft) is used instead. Here we use the popular term, drones. The diarists recorded in situ their experiences, feelings, and personal accounts, including reflections on their work, events, and lives (Rauch and Ansari 2021). We obtained consensual access to the diaries written by workers. Given the sensitive nature of the information, we did not ask diarists directly to participate (e.g., by cold calling) but relied instead on unsolicited referrals from individuals who encouraged other colleagues to participate by sharing their diaries and personal conversations.

Our experience of doing research in extreme settings, including spending time in Afghanistan visiting military establishments, gave us legitimacy in terms of our ability to relate to the military personnel and to "speak the same language." It also helped to reinforce our independent role as researchers. All handwritten diaries (14) were transcribed professionally. The data were imported into the qualitative text analysis software NVivo for further analysis.

We followed a theoretically sensitized inductive approach (Glaser and Strauss 1967; Strauss and Corbin 1998). We iterated between data, emerging themes, and theories throughout our analysis (Locke 2001). We were intrigued by how an emerging technology altered traditional warfare. Our hunch pointed to changes in the nature of work and the mixed feelings these would generate. We followed a five-step analysis process (see Rauch and Ansari 2022 for further details).

2 Findings: The Emotional Side of Responding to an Emerging Technology

We explore how the introduction of drones and the changes this brought to the way service personnel perceived their work created mixed feelings. We illustrate some key characteristics of the technology and describe the changes it brought to the core meaning, and values of work. Lastly, we identified four different response strategies workers deployed to cope with the changes in their work.

2.1 Changes in the Core Meaning, and Values of Work

2.1.1 Disruption of Spatio-temporal Boundaries

A key aspect of life in the military is "batch" living, where "play" and "work" are one. The drone program has dissolved the strict separation between military and civilian life. It has also changed the relationship to what is known as the "brotherhood," where workers typically spend "24/7 together, eat, work, shit, and party together" (Diary 10) and know "everything about each other from when the cousin of a distant aunt got a new hip, or the brother of grandpa got caught with the *Playboy* magazine at his retirement home" (Diary 30). Now that they are "not fighting side by side" but are instead "sitting side by side in front of monitors" (Interview 12), workers describe how this has disrupted the traditional separation between civilian and military life. For example, one drone operator said:

> It is a surreal feeling the moment you step out of the control room. Within minutes you are no longer in a combat zone but on your way back home to your family in peaceful America. Maybe doing a quick stop at Walmart to pick up groceries for the BBQ planned or get a slushy. Minutes before you were gathering intel in Pakistan. This transition is the hardest part of the job because one has no such switch button in the head to change from being in Pakistan to your daughter's birthday party in a second later or a fight with your wife because you forgot to take out the trash. We are expected to change from a war setting to happy family life in an instant. (Interview 09)

With the new working arrangements, the typical work schedules of "war fighting changed" (Interview 04). The schedule at the drone base now involves a minimum eight-hour shift for six days in a row, followed by three days off. One pilot described the changes in an informal meeting for a coffee off-base:

> Our birds run 24/7, 365 days a year. We are always in combat. There is never an end or a stop or anything. Wasn't it supposed to be that a war has a mission or purpose? If I worked through the pile of targets, there will be a new one. If not in country X, then country Y, without a clear pattern or rationale for me to understand. (Field note 65)

Such examples suggest the concept of war has changed, as workers have moved from short-term assignments overseas, followed by long "decompression phases" and "time off the war" (Diary 29), to a "constant war at a relentless pace" (Diary 29). In other words, "War becomes my daily job. It is in America's backyard" (Diary 30).

2.1.2 Creation of Distanciated Intimacy

Drones have allowed workers to form new and different kinds of social relationships with people they are assigned to observe, surveil, or target. Workers described this as

“taking part” in local social life through “live footage,” and it has also allowed them a peek into the mundane life of locals who appear in the background on their screens. Others described similar experiences of “feeling part of their lives,” saying, “I have been watching their family life for a substantial time. I attended the wedding of their second youngest son, the burial of their aunt, and several cousins after one of our strikes” (Diary 19). This creates distanciated intimacy, as reflected in one diary entry:

> Ordinary people aren’t that much different to us. Similar problems, fighting with the spouse, smoking, drinking, well, some illegal alcohol. Well, their sense of fashion is, let’s say, different but with 100F [38C] I also might wear loose clothing. If you take away those dresses, it could be somewhere in rural Midwest U.S. (Diary 10)

Others reported that this new “closeness” to the battlefield and to the subjects they were surveilling changed the kind of social relationship they had with those people, giving them, for example, a much better understanding of everyday life in those local settings. They also described how, despite the geographical distance, they felt part of the “last minutes of their lives,” as they witnessed and followed up on the aftermath of their deaths. An operator described this as follows:

> We sent it [the missile] down and we are live right with the action. [. . .] For half a minute the monitors are filled with smoke, and nothing is to be seen because of the thick clouds. Only then I see the outcome of the action and things getting moving. Did we get it right? Target alive or dead? Another package [missile] to be sent down? Any other incidents to report? Civilians or children? Chaos? (Diary 10)

2.1.3 Changing the Moral and Legal Parameters of Work

Given their now much more involved role – which they described as their “Big-Brother-like work” (Interview 20), “front row seats to the action” (Informal talk 43), and the “uncut version of a horror movie” (Diary 40) – workers began to question the morality and legality of what they were doing. One example was the identification of targets. For example, one typical procedure is the assessment of PID (positive identification) to confirm the demographics, including the gender and age of the people on screen to determine whether so-called military-aged men (MAMs) are present and to assess the level of threat. Such classification is crucial as it can determine whether a mission is re-classified from “kill” to “surveillance” or vice versa. One operator noted:

> We have our fixed criteria and tick the boxes with the help of video screeners and lots of people involved calling PID and MAMs. But with the live and constantly developing situation, intel, video feed, radio chatter, IRC, finding accurate answers to this question is complex. [. . .] But it doesn’t always feel like it is the most just version of the truth we are doing here. (Interview 30)

Given the sensitive nature of the work, particularly when younger children (below the age of 12) and females are involved, it is customary to consult with lawyers. This has been a significant change for many, because in conventional warfare fighter pilots already had the "green light" before taking off for their destination. In operations where a missile is to be released from an armed drone, lawyers help to assess the target and advise about potential civilian causalities "until the very last moments" (Interview 12).

In sum, for the workers the drone-led changes have led to discontinuity in their core meaning, and values, which no longer serve as reference points in their relationship to their work.

2.2 Emotional Ambivalence Arising from Conflicting Identifications with Meaning, and Values

Following these changes to core meaning, and values, workers frequently reported contradictions in how they identified with their work. They had difficulty identifying with their new role of "drone warriors" for "the Chair Force [instead of Air Force]" (Interview 21). In the words of one interviewee:

> This [drone program] is like an earthquake; it's torn down our fundaments and now all is upside down. Stripped the pilot from the airplane in the sky and put pilots on the ground in front of a monitor, pretending to fly the thing. [. . .] It raises so many questions from how I see the military, the goals and purpose of our missions [. . .] I am doing here. (Interview 10)

Workers found it hard to relate to this new normal. This was reflected in statements such as "I am no longer sure who I am in relation to the USAF" (Diary 11) or "These changes left me asking who the heck am I" (Diary 29). The drone program was described as taking the essence out of "being a soldier." One worker described how the introduction of drones had "brought good and bad," with some aspects making him want to weep while others made him want to celebrate, with the result that "ultimately I just feel torn." Workers thus experienced conflicting emotions about their work.

2.2.1 Positive Identification

Despite the severity of the changes and the disruption to values and meaning, most workers stood by the military doctrine, regarding it as being part of the Air Force. For example, during a calm moment on a field visit, one pilot reflected on the importance of their training as a key point of identification, including the values and meaning and what mission success meant to him:

> Above all I am soldier, and the biggest goal is to have the six of my colleagues and bring everyone back home [. . .]. We get into big trouble if an RPA crashes or, God forbid, it's taken down by the enemy but between us, I don't mind so much. If a UAV goes down, we lose money, but if an actual plane goes down, we lose one of our own. [. . .] Now everybody can serve [in the USAF] and it is not at all about bravery and sacrifice like before. (Field note 91)

Enabled by the new work schedules, workers pointed out that the changes allowed them to be "in two places at once" and had positive effects on the "soldier's work–life balance" (Interview 11). For example, workers welcomed the change to have a "9 to 5" job as it "finally allowed a normal family life, being a present father and not missing school recitals" (Diary 31) and provided a "good chance not to tank this marriage like the one before, where I was more gone [military assignments overseas] than married" (Interview 22).

2.2.2 Negative Identification

At the same time, working for the drone program was also seen by many as "career suicide," a "dead-end job," or a "de facto demotion." While being a fighter pilot is an esteemed professional identity, popularized in movies like *Top Gun*, being a drone pilot is regarded as an emasculated role, requiring no bravery or physical endurance, and is often seen as a second-rate military career (Internal document 236). Many regretted not seeing themselves as soldiers anymore, given their "lack of skin in the game," and lamented getting much less respect than colleagues "who actually travel to the front line." Workers thus began to question their fit to the values of their work:

> The military was a guiding principle before, and I was very excited to be part of this force protecting our country. There was always a very good fit between me as a person, as a soldier, and the AF. You could also say, we were one person. [. . .] Now with the UAV stuff, I started to very much raise this question if this still holds true. [. . .] Stuff like 'leave no one behind,' which was *the* value, now doesn't apply, and many things are just not the same. Next to me sits a 20-year-old who looks like he's doing competitive eating. There is zero discipline if you ask me. (Interview 17)

Overall, it was not only experienced personnel who questioned their fit to the organization, experiencing both negative and positive identification. Even recent recruits without on-the-ground experience in foreign territory struggled to identify with the "degraded" nature of the work. They described how the experience did not match their image of the military.

2.2.3 Conflicting Identifications Evoke Emotional Ambivalence

Workers experienced “conflicted feelings” in relation to the changes brought about by the UAV program and their implications; these feelings ranged from anger, embarrassment, and guilt to pride, satisfaction, and sympathy. Many workers told us how they felt a sense of pride and excitement now being closer “to action” and were positive about the improved situational awareness and the advantage the technology offered in fighting the war on terror. In a heavily redacted doctoral thesis, an Air Force lieutenant noted that:

> they [mission commanders] saw more battles, saved more lives, and killed more insurgents than their airborne peers, and they cherished the relationships they developed with supported ground forces. (Cullen 2011, 200)

To varying degrees, all workers questioned the core meaning, and values of their work. While some cited a particular pivotal event (e.g., a major strike that went wrong), others described a longer process, referring to “weeks that I had this question in mind of where I actually stand” (Interview 22) and “going-back-and forth between my conscience and the sheer fact we live in a brutal world” (Diary 20).

2.3 Workers’ Strategies for Coping with Emotional Ambivalence about their Work

We identified four different strategies used by service personnel to address the contradictions in how they identified with their new work and to cope with the emotional ambivalence that these contradictions evoked: (1) *Unconditional re-identification*, (2) *Reconciled identification*, (3) *Sidestepping identification*, and (4) *Estrangement*. Appeals for help to those higher up the military hierarchy fell on deaf ears in an organization with a strong chain of command, and discipline. Such requests were “quickly muted and there was no interest from any side to provide help” (Interview 05). Our respondents confessed that emotions or mental health issues were a taboo topic that “does not belong in the military.” They were told to “man up” as “a soldier never shows any weakness” (Diary 23). They were thus required to figure it out on their own.

2.3.1 Unconditional Re-identification

The first strategy was to simply disregard the problematic aspects of the new technology by upholding the sanctity of the military values. Falling back on entrenched values and ignoring troubling emotions was a strategy employed by one group of workers (20 individuals); they resorted to the core values of being a soldier and of holding fast to the overarching purpose of safeguarding the country against evil forces. These individ-

uals had strong roots in the military community. They coped by reminding themselves that choosing to become a soldier was a decision for life. Those in this group often made statements such as “All in, all the time” and “My purpose is to serve, whatever demands come to me.” A drone operator emphasized the importance of the sanctity of the chain of command:

> Where will we land if we question each and every step of the chain? This is how it ran over hundreds of years. We have to trust the system, although this sometimes is of course not so easy when you are paid to watch children die. (Interview 13)

One individual with vast military experience noted that this “change was different than previous changes” (Diary 10). However, another operator noted that the UAV program “still has the same goals”:

> What we do here isn’t that new or worth a big outcry by the media. Our purpose is the same. We protect the United States of America. We have used missiles and bombs as part of our strategy for many decades. It’s just a different technology that does it now. Civilians are affected in every war. This goes back to when mankind was created by God. [. . .] It is just a different tool to protect our country. (Interview 7)

This strategy of falling back on existing values was different from constructing new meanings, as the members of this group did not try to justify the contentious use of drones. They argued that the goals of drone warfare were no different to those of conventional warfare: namely to weaken or destroy the enemy. They reminded themselves of the need for impassive emotional control or, in their words, to “ignore and overwrite,” as had been inculcated in them during their training.

2.3.2 Reconciled Identification

This strategy was employed by 17 of the workers we studied. These workers coped by looking for meaning outside their narrow mission and reframed the new work as meaningful and legitimate. They chose to regard the change in their work in a positive or righteous light and as a “force for good.” One person said “there are just certain rules of the game that cannot be changed. So, it is our task to seek meaning again in our work” (Interview 22). An experienced personnel described how drones were a technological advancement that enabled them to be “more precise,” pointing out that “now we can click and select who they want to target” (Interview 25) and cause less collateral damage than with aerial bombing. Another person stated that:

> We can be more efficient now. We have moved to being a surveillance company and have amazing situational awareness now. We can protect the good local people like Tik, Trik, and Trak [cartoon-inspired nicknames that the operator liked to check on]. And we can precisely target [those] that need to be removed from the world, because we can really see now their movements 24/7. (Interview 29)

Members of this group came to appreciate how technology had changed the face of war. One diarist noted:

> We have to go with the time and be OK with moving away from the thrill seeking face to face with the enemy. This new technology allows us to bomb [. . .] from a safe distance without putting any of our boys in harm's way. This is the way to go forward. (Diary 31)

Those who drew on this strategy moved from mission-specific goals to private motivations, such as doing it "in the name of my fallen brothers," "helping little girls go to school," or "making the world a better place." This strategy was different from falling back on established values as these workers were not simply reminding themselves of the military ethos but were rather extending the meaning of their work.

2.3.3 Sidestepping Identification

Focusing on the "job at hand" and "not getting too caught up in it" was the third type of response strategy. Those using this strategy (seven individuals) sought to ignore their concerns about the deeper meaning of work. They "accepted things" as part of their job. They focused on the "money," treating their work as a "job to make ends meet" and not as a higher purpose or calling to protect their country:

> I don't want to get involved in the politics of all of this. For me it is just a job. Stuff that others seems to care about, that we walk around in (Air Force pilot) overalls, I don't care much about that. I mean, it's good they give me work clothes and I don't need to bother with buying clothing just for work, right? Yes, I often have to swallow down [stuff] but I just stick to the routines and do what is required of me. I try not to think much and just do my work. (Informal conversation 21)

The majority of those in this group had relatively little experience in the military, did not come from military families, and were not deeply rooted in the military community. Instead, some were recruits from gaming conventions, and the UAV program was their first experience of the military. One person told us:

> I am not attached to the whole military thing. I got inside because I saw the ad and it is good money. I am a school dropout and there is not much available where you can make easy money and don't work your body to death. (Interview 37)

This strategy of focusing on the task at hand was different from falling back on established values (unconditional re-identification), even though many tried to suppress their emotions. However, they did so not because of the soldiers' imperative to "ignore and override"; instead, they used emotional control as a protection mechanism to survive in the job and reap its perks, including free healthcare.

2.3.4 Estrangement

Finally, when none of the first three strategies seemed viable, workers severed their ties and left the organization. This last strategy was based on a refusal to compromise. In total, 14 individuals decided to leave the organization. Four of these had previously been in the “fall back on entrenched values” group (*unconditional re-identification*), four in the “create new meaning” group (*reconciled identification*), and six in the “avoid meaning” group (*sidestepping identification*).

Individuals stated that they could “no longer emotionally control and avoid their actual feeling of disappointment in the military system and what we are actually engaging in” (Interview 22). Some became disillusioned, despite their good standing in the military community. One decided that the “only option was to leave the Air Force” and declared that “now war has no finish line” (Diary 20). Another noted that “War has a grip around your soul, and I needed to get away from watching people die on a screen” (Diary 2). Members of this group “saw no other alternative than leaving.”

Workers reported they could not “reconcile” themselves to such difficult experiences and felt disturbed about being involved in something that went against their “understanding of what fair means” (Interview 22). They had issues with the secrecy around people on their “target list” and with not knowing “who and how [someone] ends up on my desk” (Diary 02). Working in the drone program had severe effects on many personnel, leading to sleep deprivation, PTSD, and drug abuse. In particular, those who had “focused on the paycheck” could not continue, having soon realized “that the money isn’t worth it for watching people die” (Diary 41).

Many cited “wanting to forget” and “peace of mind” as reasons for leaving. A former drone operator stated:

> I needed to save myself. I couldn’t go on working for this assassination program any longer. And at least I know that, if I go, they will be at least one man short to already being under capacity, which means at least for some minutes fewer killings will happen until they can recruit some naïve high schoolers with a gaming addiction. (Interview 23)

In summary, we identified how people used different response strategies to handle the emotional ambivalence they experienced. By drawing on these strategies at different points in time, individuals attempted to cope with that emotional ambivalence and to establish what they called a “moral peace.”

3 Discussion

Our findings allow us to make three main contributions to the literature on technologies and work.

3.1 Emotional Responses to Remote Technologies

We extend studies on technologies by showing how people respond emotionally to a remote technology based on the values that tether them to their work rather than on disruptions to their role, power, or status, and how strong emotions are evoked when these values are violated by the technology. We explain how meaning, morality, and feelings play a part in workers' responses when emerging technologies disrupt the meaning and values that have traditionally underpinned their work.

Studies of technologies and work have examined how technologies evoke emotions such as awe and excitement or stress, anguish, and insecurity stemming from a lack of trust in the technology (Bailey, Leonardi, and Barley 2012; Beaudry and Pinsonneault 2010) but they do not focus on the emotions that may arise from doubts about the morality of the technology. In contrast, we explain the role of *moral emotion*s pertaining to feelings of right and wrong in shaping workers' responses. For example, workers may form moral judgments about the technology; some of them may see drones as allowing a "humane war" to be conducted, whereas others may see them as enabling unsuspecting targets to be killed with impunity, targets whom they are watching at the very end of their lives. Such moral judgments evoke feelings of both satisfaction and guilt, and workers deploy a mix of strategies to come to terms with the ambivalence they experience about their work.

4 Conclusion

Emerging technologies are increasingly reshaping human action and interaction across a wide variety of domains, transforming how we work and live (Bailey and Barley 2020; Von Krogh 2020). We suggest that workers' responses to these technologies are based not just on how these changes disrupt the way work is organized, transform roles, or disrupt power hierarchies in the workplace. Rather, they are centered also on the workers' own feelings about the core meanings and moral values that tether them to their work. We have shown how workers experience and respond to remote control technologies (Bailey, Leonardi, and Barley 2012) that disrupt the meaning and moral values of their work and evoke emotional ambivalence. Drone technology has allowed distanciated intimacy by enabling warfare to be conducted remotely while also giving those involved a graphic picture of the potential targets of their drone strikes. It has also allowed war to be conducted "endlessly" and potentially anywhere on earth by stretching the spatio-temporal boundaries of war and redefining its moral and legal parameters. Workers struggled to identify with the new normal of work and deployed several strategies to come to terms with it. Our study shows that people do not necessarily value primarily the immediate benefits or re-

wards that new technologies can bring to their work but may instead be seeking a sense of meaningfulness and moral fulfillment.

Seminar Questions

1. How did the nature of work change through the introduction of the drone technology?
2. What were the opportunities and challenges perceived by drone operators?
3. How did the drone operators address the experienced challenges?
4. What should the drone operators have done in your opinion?
5. Which challenges do you see arising in the future for emerging technologies?

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Daniel R. Brunstetter

10 The Post-9/11 Era: Drones and Just War Theory

Abstract: Armed drone technology has fueled the belief that modern war can protect 'our' soldiers and 'their' civilians at the same time. However, their deployment in various military theaters has raised important ethical questions. Practitioners, military officials, and government leaders have turned to the principles of just war theory to address these issues, but despite the claim that the drones are the most ethical weapons in human history, scholars have also turned to the language of just war to offer a more critical appraisal of the drone revolution in military affairs. This chapter provides a generalized assessment of the ethical concerns raised by drones, employing the widely accepted ethical categories of just war theory: *jus ad bellum* (justice of going to war), *jus in bello* (justice in war), and *jus post bellum* (justice after war) exists. A section devoted to each highlights the central questions drone use has raised and provides insights into the key debates. Illustrative examples drawn from the controversial United States' drone program spanning the embers of 9/11 to the present day, highlight the enduring ethical questions that remain hotly debated. The conclusion widens the scope of the subject by introducing further avenues of ethical inquiry related to armed drones.

Keywords: Just war, ethics, global war on terror, targeted killing, civilian casualties

1 Introduction

The advent of drones has revolutionized military affairs (Kreps 2016; Plaw, Fricker, and Colon 2015; Rogers and Kennedy-Pipe 2019). Armed drone technology has fueled the belief that modern war can protect 'our' soldiers and 'their' civilians at the same time (Anderson 2010). But their deployment in various military theaters has raised important ethical questions. Practitioners, military officials, and government leaders have turned to the principles of just war theory to address these issues (Brunstetter and Jiménez-Bacardi 2015). However, despite the claim that the drones are the most ethical weapons in human history, scholars have also turned to the language of just war to offer a more critical appraisal of the drone revolution in military affairs (Brunstetter 2012). In this chapter, I provide a generalized assessment of the ethical concerns raised by armed drones. To do so, I employ the widely accepted ethical categories of just war theory. A rich scholarship examining the three categories of *jus ad bellum* (justice of going to war), *jus in bello* (justice in war), and *jus post bellum* (justice after war)

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exists (O'Driscoll 2007). Drones, in some ways, fit into existing moral standards, but in other ways challenge them (Brunstetter and Braun 2011).

Across the chapter, the reader will be introduced to the ethical principles comprising the just war categories. These principles provide a moral vocabulary to critically evaluate the use of drones. A section devoted to each highlights the central questions drone use has raised and provides insights into the key debates. Illustrative examples, drawn from the controversial United States' (US) drone program spanning the embers of 9/11 to the present day, highlight the enduring ethical questions that remain hotly debated. The conclusion widens the scope of the subject by introducing further avenues of ethical inquiry related to armed drones.

2 Jus ad bellum

The category of *jus ad bellum* has six moral principles. These are: just cause, last resort, right intention, legitimate authority, proportionality, and probability of success. These principles help to regulate the decision to go to war. In this section, I employ them to showcase the moral dilemmas associated with armed drones.

2.1 Just Cause

Just cause delineates the right reasons for going to war. In the modern era, self-defense is widely considered to be the only undisputed just cause for waging war. As written in the UN Charter, states have the inherent right to use military force to defend their territory and interests from outside threats.

Drones have revolutionized how states can act on just cause. Drones effectively remove the physical risk from our soldiers or Special Forces, who would otherwise face death when confronting terrorist threats because drone pilots operate in relative safety, far removed from where the threat is located. This has problematically fueled the perception that a state can wage relatively risk-free warfare against terrorist threats operating from afar (Renic 2020). Such a perception enables uses of lethal force that would otherwise have been too risky. Some scholars see this advantage as providing a moral imperative to employ drones instead of soldiers (Strawser 2010).

For example, the US has used drones to target terrorist groups threatening US interests, personal, and the homeland in the so-called global war on terror. Since the first US drone strike that killed al Qaeda operatives in 2002 in Yemen, thousands of US drone strikes have killed members of a myriad of different terrorist groups (al Qaeda and its offshoots, ISIS, and al-Shabab, to name a few) operating in a multitude of countries (Yemen, Somalia, Afghanistan, Pakistan, and elsewhere). In military parlance, these morally problematic strikes are called targeted killings (Finkelstein, Ohlin, and

Altman 2012). The US claims that these strikes are in self-defense against ongoing threats and that it can act on the just cause of quelling a terrorist threat no matter where these groups reside, if the local government is unable or unwilling to deal with the threat.

There are, however, several points of concern to raise. First, *the permissiveness critique* – the worry that drones allow states to act on just cause too easily (Brunstetter and Braun 2011). What distinguishes drones from other military platforms – such as cruise missiles or fighter jets – is their ability to loiter and track their targets, sometimes over days. This gives rise to what John Williams (2015) calls a form of *distance intimacy*, the ability of drone operators to observe targets in a risk-free environment, which proponents argue enables more effective observation of the discrimination and proportionality principles in comparison with alternative weapons. The ability to conduct such strikes 'out of the blue' offers a tactical advantage that other weapons do not have. Drones thus provide a military option against threats that hitherto would have been attackable only at greater risk. It is worth asking, however: of the thousands of drones strikes chronicled, how many targets would have been struck if drones did not exist? Would less accurate (cruise missiles) or more risky (Special Forces raids) options have been employed? Acting too loosely on just cause becomes a problem for many reasons that we will address below. Drone strikes are never insulated events; they regularly have cascading consequences that impact the other just war principles.

Second, *the biased judgment objection*. Some drone strikes have an air of punishment for crimes previously committed. The death penalty out of the blue! Stated differently, even though a member of a terrorist group poses no direct threat in the present moment to US interests, they remain liable to a drone strike for their role in previous terrorist attacks on US interests, going as far back as 9/11. The challenge here is whether punishment is a just cause. Historically, punishment was central to just war thinking, but, in the modern era has largely been phased out. But drone strikes have brought punishment back into the mix (Braun 2019). In his defense of US drone strikes in 2013, President Barack Obama said they are not a form of punishment, but a response to an ongoing threat. Yet, punishment lurks in the justificatory rhetoric. Consider President Joe Biden's remarks about the August 22, 2022 drone strike that the killed emir of al Qaeda, Ayman al-Zawahiri:

> Now, justice has been delivered and this terrorist leader is no more [. . .] The United States continues to demonstrate our resolve and our capacity to defend the American people against those who seek to do us harm. We make it clear again tonight, that no matter how long it takes, no matter where you hide, if you are a threat to our people, the United States will find you and take you out. (Biden 2022)

The concern is that as punishment returns into vogue, the difficulty of being an impartial judge clouds decision making. The risk is that a state becomes the judge and executioner all rolled into one, thus leading to self-serving and excessive punishment.

And third, *the paradigm debate* – the concern whether drone strikes outside declared war zones can ever be justified. Critics say that these strikes are illegal and immoral because just war norms simply do not apply; such strikes amount to assassinations that violate the victim's right to life (O'Connell 2010; Glazier 2016). Instead of drones, the more restrictive law enforcement paradigm should be the norm to deal with terrorism. Arrest, trial by jury, and only if convicted, some form of punishment. But if one accepts that drone strikes outside the hot battlefield are legitimate, then the remaining other just war principles can be of use.

2.2 Last Resort

Despite claiming a preference for capturing presumed terrorists, the US policy is heavily influenced by a view of imminence that challenges conventional notions of last resort.

The last resort principle relates the idea that every possible non-violent option should be tried first before resorting to lethal force. Drones arguably raise the threshold of last resort for large-scale military deployment by providing a way to avoid deploying troops or conducting an intensive bombing campaign while still counteracting perceived threats. Paradoxically, however, the increased use of drones suggests that they may encourage countries to act on just cause with an ease that is potentially worrisome. Indeed, evidence suggests that drone strikes outside the hot battlefield are sometimes seen as a measure to which the principle of last resort does not apply (Brunstetter and Braun 2011).

The US drone program, based on a controversial understanding of imminence, illustrates the point. The argument is that the threat of terrorism arguably alters the meaning of imminence, such that a terrorist attack was always imminent (Brooks 2014). Members of groups such as al Qaeda, and others, too, are always planning to strike somewhere. Thus, the threshold of last resort is always already crossed, which then forgoes non-lethal means to deal with the threat given the risk and difficultly of capture in most circumstances. Lethal force becomes by default the go-to option.

But this is not how last resort works in just war thinking. Last resort is situation dependent – every scenario has non-lethal options to try first. Imminence is not a blanket assumption that applies across all cases. Yet the ability to act on just cause so easily risks emboldening leaders to act lethally, hence engendering *the threshold challenge*: when exactly is the threshold of last resort for a drone strike crossed? This question can be broken into a series of more precise questions.

Is the threat really imminent? What does imminence mean for a drone strike? If not drones, what other options are there to deal with the threat? Attempt to capture? Wait and watch? These are debated questions. The US case illustrates shifting moral sands: a more permissive take on last resort justified, under the Bush and Obama administrations, what are referred to as signature strikes. These strikes target unidenti-

fied militants who were simply part of a terrorist group based on their behavior patterns and personal networks (Zenko 2013). This policy was subject to intense international critique. The Obama administration then reformed the drone program, putting into place greater restrictions to protect civilians that restored some notion of last resort. Strikes were permissible only when capture was unfeasible and when the individual posed a direct threat. Under the Trump administration, the restraints were unhinged (Brunstetter 2019), only for the Biden administration to renegotiate the moral mechanisms of restraint (Kreps, Lushenko, and Raman 2022).

2.3 Right Intention

Right intention conveys the view that lethal force should be used for the right reasons. Self-defense, not vindictive justice. Protecting lives, not wanton bloodlust. Restoring peace and order, not sowing the seeds of trouble. We have already seen how drones, used in self-defense, lay on a slippery slope. There is a real risk of sliding from self-defense to punishment to unnecessary vindictive justice, as the Biden quote above illustrates.

There are other concerns as well. Studies show that drones that loiter and strike 'out of the blue' bring the warzone to places where terrorist groups operate. Reports from human rights organizations showcase how drones unsettle daily lives and disrupt social patterns by creating a culture of fear among civilians living under aerial occupation (Human Rights Watch 2013; Emery and Brunstetter 2015). The fear of a strike 'out of the blue' is captured in this testimony by Rafiq ur Rehman, a Pakistani primary school teacher whose mother was killed by a US drone:

> [A]s a teacher, my job is to educate. But how do I teach something like this? How do I explain what I myself do not understand? How can I in good faith reassure the children that the drone will not come back and kill them, too, if I do not understand why it killed my mother and injured my children? (McVeigh 2013)

A sustained drone campaign is thus marked by *the protection tradeoff*, the moral compromise one has to make when using drones in self-defense of 'our' citizens and homeland at the expense of bringing the warzone, with all of its psychological costs, to the 'Other' in some foreign land. Most of us live oblivious to the cost of the drone wars abroad. But even though drones have a light military footprint and bring little physical risk to 'our' soldiers – studies do show drone operators suffer from PTSD – suggesting drone warfare is far from 'clean' (Chapa 2017).

2.4 Legitimate Authority

One view of legitimate authority paints the legitimacy of lethal force as a universal right to self-defense, even if this means violating the sovereignty of other states. This permissive view challenges the strict definition of sovereignty prohibiting the intervention in a state's internal affairs by other states unless by consent or legitimized by the United Nations (UN). Yet, this Westphalian view of sovereignty is not impervious to exceptions, or what Rosa Brooks (2012) refers to as sovereignty-limiting doctrines that threaten to erode its impenetrable veneer. Drones can empower states to 'go it alone' if the situation requires; it is politically easier to send in the drones than, say, Special Forces or entire battalions who might come home in body bags. "Although drones are not illegal weapons," explained UN Special Rapporteur Christopher Heyns (2013), "they can make it easier for states to deploy deadly and targeted force on the territories of other states." This is the essence of the *self-defense oriented* drone paradigm the US has implemented (Reitberger 2013). The US stance is sometimes referred to as the *unable and unwilling doctrine*. Such a policy stance places US interests above the sovereignty of other states insofar as the US sees it as legitimate to undertake drone strikes within the borders of other states. Scholars refer to these spaces as pockets of *contested and fragmented sovereignty* where states do not fully control what goes on within their borders, thus allowing terrorist groups to operate there (Brunstetter and Holeindre 2018). One concern is that the US drone precedent could lead to the emergence of a problematic norm about the legitimacy of unilateral limited force that other states will embrace. Such a norm could lead to excessive uses of preventive force that would undermine human rights in the long-run (Fisk and Ramos 2016).

A more restrictive view sees legitimate authority through the lens of the international community, ideally undertaken by a broad coalition – *a committed collective* – with a UN mandate. France, for example, has employed drones in the Sahel region of west Africa as part of its counterterrorism campaign against al Qaeda affiliates, with the goal of helping the Sahel states re-establish their territorial and constitutional integrity. Defending the French acquisition of armed drones, Defense Minister Florence Parly (Agence France-Presse 2019) cited the need to adapt: "Beyond our borders, the enemy is more furtive, more mobile, disappears into the vast Sahel desert and dissimulates himself amidst the civilian population [. . .] Facing this, we cannot remain static. Our methods and equipment must adapt. This is a new capacity, not a change in doctrine." Notably, France had permission from the host states in which the strikes have taken place, but when this permission was withdrawn (in Mali), the French have chosen to no longer conduct drone activities there. This choice limits the scope of their counter-terror activities, potentially creating security vulnerabilities.

These two examples raise questions about how differing notions of legitimate authority (and sovereignty) enable or restrain the novel features of drone technology. Stated differently, drone technology need not be sovereignty-limiting weapons that violate the sovereignty of other states; this is a political choice.

2.5 Proportionality and Probability of Success

The proportionality criterion states that the predicted benefits of a war – the goods – should outweigh the anticipated costs – the harms – over the course of the conflict. Drones, because they have a light military footprint, are lower the risk to our troops and are adjudged by advocates to be more accurate than other weapons. They thus have lower costs by default. Proponents argue they are effective in tracking and killing suspected terrorists, thus providing the goods. They are thus considered to be a very proportionate way of fighting the war on terror, especially compared to other options, such as ground invasion and occupation, or sustained air campaigns (Anderson 2012). But critics say risklessness is an illusion (Sparrow 2021).

Probability of success warns leaders against waging wars they cannot win. Success in the drone wars can be measured in multiple ways. One way is the extent to which drones keep terrorist groups on the run, disrupting the planning and carrying out of attacks through constant harassment from the skies. This is the *deny safe-haven* strategy. Another measure of success could be strikes that decapitate the leadership or those with special skills (such as bombmakers), thus reducing the ability of the group to function. However, skeptics show that the US policy and doctrine are characterized by problematic conceptualizations of 'failed and failing states,' 'ungoverned areas,' and '[terrorist] safe havens' that are not context-appropriate (Page and Williams 2022). The ultimate version of success is the following scenario, which the US initially set as a goal: drones would decimate the ranks of terrorist organizations, greatly weakening their power and capacity to carry out attacks. A *tipping point* would be reached whereby drones would no longer be needed, replaced by transnational and/or local law enforcement (Johnson 2012).

The challenge, which we return to below, is that this tipping point has never arrived. The US drone wars are, for all intents and purposes, better characterized as 'forever wars.' How does one measure proportionality in a conflict that never ends? What does the probability of success mean if we keep moving the goal posts of victory?

One way to answer these questions is to define success as preventing major attacks on 'our' cities. This means relative peace at home is seen as a good that outweighs the costs – to civilians living under drones – of perpetual drone wars abroad. The costs will not remain stagnant, however. In times of relatively little threat, drone strikes will be scarce; but when the threat is deemed high or really imminent, then more drone strikes could be seen as justified to squelch it. Proportionality would thus constantly be evaluated on a *rolling basis*.

However, as alluded to above, this creates a human rights tradeoff. While not unique to drones, the protection tradeoff is accentuated by the contested perception that drones enable states to pursue riskless warfare. To secure the protection of the right to life for 'us' requires undermining that right for others insofar as a sustained drone campaign creates a host of *jus in bello* problems.

3 Jus in bello

The category of *jus in bello* has three moral principles. These are proportionality, distinction, and necessity. In this section, I provide a nuanced reading of these criteria while highlighting some of the main controversies related to armed drones.

3.1 Proportionality

The proportionality principle helps gauge whether the benefits of a specific strike outweigh the costs. The attacker is required to forego any attack where the incidental damage expected is excessive in relation to the anticipated direct military advantage. In other words, don't strike if the harms (usually measured in civilian casualties) outweigh the goods (such as eliminating specific threats, disrupting terrorist activities, and killing influential leaders).

Proponents hail drones as the most proportionate weapon in human history. Kenneth Anderson claims that even the most extreme estimates of civilian casualties caused by drones,

> [when] compared to the history of civilian deaths in war, represent a very considerable improvement [. . .] The point, rather, is that these technologies are making targeting in war more precise on any historical measure, and criticizing them on a snapshot basis – your technology killed civilians, it's another war crime – rather than on their historical trend line, the horrors of urban battle in the Second World War as a baseline, seems to me morally indefensible. (Anderson 2012)

Put bluntly, drones succeed in killing terrorists while drastically minimizing the risk to noncombatants compared to other weapons.

Yet, critics point to the problem of *proportionality relativism* – the use of impertinent comparisons to argue drones are proportionate because they cause less collateral damage than other uses of force. Such comparisons misrepresent the true meaning of proportionality as an independent assessment of the balance between the anticipated civilian harm and military gain associated with each act of force (Braun and Brunstetter 2013).

There are many ways to think more precisely about proportionality. Distinguishing between *narrow* and *wide* proportionality can provide nuanced insight. The former explores whether the harm inflicted exceeds that to which the target is liable; the latter adds to this calculation the impact on affected third parties.

Narrow proportionality focuses on military advantage and the costs of achieving it. To garner the full meaning of military advantage, it is useful to distinguish between different types of drone strikes. It may be determined that a strike to prevent an imminent threat or to protect ground forces under attack are high order goods that, to achieve, might tolerate greater levels of harm, including civilian casualties. These casualties are often put into the category of collateral damage (and are not necessarily

illegal or immoral). On the other hand, for strikes against low-level targets as part of a campaign to deny safe havens that yield a lesser military advantage, less moral latitude for inflicting unintended harm on noncombatants would be permitted.

To garner the full meaning of harms, one must look at more than just civilian casualty numbers. Even when these are low, other harms can occur, especially during sustained drone campaigns. Rafia Zakaria's (2015) analysis of the US drone campaign in Pakistan, for example, forces us to consider more than just the numbers of dead from drone strikes. Zakaria provides a disturbing portrait of how human rights are negatively impacted by living under drones, and in the process, challenges the claim that drones are discriminate and proportionate weapons. To take these wide proportionality concerns into account, some scholars suggest that drone use must also satisfy the *psychological risk principle*, which asks us to weigh the wider, negative impact on those susceptible to a violent death 'out of the blue' against the goods that drones are supposed to provide (Brunstetter 2021, 216–219). Is the constant psychological risk to civilians excessive compared to the military advantage the US, or another drone wielding power, might gain?

3.2 Distinction

The distinction principle (sometimes also called discrimination) distinguishes between those who are legitimate military targets and those who are not. The most basic distinction is between combatants who are legitimate targets and civilians who are not. One of the most important advantages of drones highlighted by proponents is that they are better able to satisfy this principle compared to other weapons (Brennan 2012). Drones can track and survey a target to make sure the target is indeed a threat, and, ideally, wait until no civilians are in harm's way to strike. Some drone operators describe following a target over the course of days or weeks to gather a pattern of their behavior, finally pressing the button only when they were isolated (Gusterson 2017).

Unfortunately, the ideal case described above is not necessarily the norm. In contrast to claims of minimal civilian casualties by US officials, non-governmental agencies have reported worrisome statistics about civilian casualties (Alston 2010; Heyns 2013; Emmerson 2013; Human Rights Watch 2013; Amnesty International 2013). Despite what the rhetoric of proponents sometimes suggests, drones are not infallible weapons; they depend on accurate intelligence as well as human judgment. Mistakes that kill civilians – like the drone strike in Afghanistan on August 29, 2021 that killed ten civilians including several children – do occur.

A more complex view of distinction tries to parse out who among the combatants are legitimate targets. Is every member of a terrorist group a legitimate target? Or only leaders? During the controversial US drone campaign in Pakistan during the first Obama administration (2009–2010), a drone strike occurred on average every three

days. Most strikes targeted low-level members. Notably, this was also the period marked by the greatest number of civilian casualties (Braun and Brunstetter 2013).

The international backlash to Obama's drone war led to reform. Obama touted drones' ability to satisfy the distinction principle and proffered the *near certainty standard of zero civilian causalities* (Obama 2013). Only strike if there is an extremely small chance that civilians will be injured or killed; this standard is even more demanding than the requirements of international law.

The upshot is this: despite drones being better than other weapons at satisfying the distinction principle, they remain prone to error. And the more strikes undertaken, the greater the risk of error endangering civilians.

3.3 Necessity

The concept of necessity interrogates whether a specific use of force is required to achieve the just cause. Because drones allow states to take the fight to terrorist groups and put pressure on them, there is a wide range of potential targets that could come within their sights. Low-level members, drivers, couriers, financiers, bombmakers, propaganda spokespeople, and high-ranking leaders. While some level of sustained pressure – the fear of a strike out of the blue – is needed to keep the group on the run and disrupt their activities, how much pressure? And who should drones target in pursuit of this just cause? This is *the necessity challenge*.

One way to answer these questions is to simply acknowledge that drone operators can target any member, assuming that civilians will be spared to the extent possible. But following this strategy will lead to sustained strikes and, as discussed above, put civilians at greater risk of physical and psychological harm. A more restrained strategy could be to target only those who pose an active threat (Brunstetter 2021, 224). This would reduce the number of targets, and presumably, the number of strikes as well. Focusing on discerning active threats, as opposed to lingering threats that might materialize someday, would work towards restoring some notion of last resort to drone strikes. Instead of seeing imminence everywhere, there would ostensibly be more time to watch and wait, while trying other means, such as law enforcement, to quell emerging threats.

The upshot is that drones allow for multiple strategic choices, some of which operate under greater restraint than others. These are, it is to be stressed, political choices. The US example shows how different presidents have prioritized different strategies. Under Bush and Obama, necessity was viewed permissively; a shift towards greater restraint occurred under Obama after international backlash to the drone war in Pakistan, leading to more constrictive rules about targeting. These rules were in large part repealed by the Trump administration, which opted for the more permissive *reasonable certainty standard.* For Biden's part, the drone program is undergoing

a rethink, with greater constraints set to be implemented as part of the *over-the-horizon strategy* that prioritizes drones as a counterterrorism tool (Rosen 2021).

Regardless of the level of restraint, however, there will be ethical dilemmas so long as drone strikes continue to occur. This brings us to the final section on justice after the drone wars.

4 Jus post bellum

The category of *just post bellum* provides moral guidance that shapes the post war period. Considerable ink has been spilled on what the principles might be, engaging the six Rs – rebuilding, reconciliation, rights vindication, reparations, restitution, and retribution – in the post war setting. Scholars distinguish between the maximalist and minimalist approaches (Bellamy 2008). The maximalist approach is the form of *jus post bellum* we envision when thinking about the democracy building wars in Afghanistan, Iraq, and Libya. Here, justice implies a sense of responsibility to the society of the vanquished. Economic and political rebuilding coupled with rights vindication and reconciliation. The key here is a clear line between victor and vanquished, where the former imposes its will on the latter to reshape the post war society. However, the drone wars do not fit this mold because there is no clear sense of victory, which raises a host of ethical issues.

4.1 Drones and Perpetual War

As discussed above, the mythical tipping point where drones would no longer be needed and a return to peacetime law enforcement measures has not been reached. It may be the case that this point never will be reached because of the mirror relationship between ever-present terrorist threats and the perceived ability of drones to wage riskless war. If one has a hammer, strike wherever there is a nail. Such is the *perpetual war risk*, namely, that drones, because of their perceived riskless appeal, will enable a never-ending conflict with ever-evolving terrorist groups (Enemark 2014).

The US drone wars offer a case in point. The self-defense oriented paradigm does not seek peace and reconciliation. The US is not aiming at a form of victory that would allow it to impose its will on the territories where drone strikes take place. Rather, the goal is to keep the warzone as far away as possible from US shores even if that means imposing warlike conditions elsewhere indefinitely. Obama's (2013) defining speech about the drone wars implicitly acknowledges this dark side to victory: "Our victory against terrorism won't be measured in a surrender ceremony at a battleship, or a statue being pulled to the ground. Victory will be measured in parents taking their kids to school; immigrants coming to our shores; fans taking in a ball-

game." Note the focus on *our* cities, while drones patrol the skies and strike the cities of others.

In this case, it is difficult to talk about achieving a form of victory that would facilitate rebuilding areas impacted by drone strikes. Reconciliation is also problematic insofar as studies on US drone warfare suggest that drone strikes causing civilian casualties create anti-American backlash and facilitate terrorist recruitment (Boyle 2010).

What, then, does justice look like in a perpetual drone war? This is where the minimalist approach to *jus post bellum* offers some insights.

4.2 Justice after Drone Strikes

If we consider victory in terms of keeping terrorist groups at bay with drones, what might the minimalist approach offer in terms of ethical insights? This outlook allows victors to protect themselves and punish threats and perpetrators of past crimes. In this scenario the winning state, as Alex Bellamy (2008, 606) explains, has limited post war responsibilities to its enemies and is entitled to "decide instead to settle for the restoration of the status-quo." Following this logic, the status quo might simply mean perpetual hostilities, with the threat of drone strikes shaping the daily lives of antagonists. Such strikes would be a mixture of self-defense (denying safe havens) and retribution (punishment of individual terrorists' transgressions). This outcome carries with it a perpetual risk of civilian casualties, which raises the question: What responsibility do drone wielding states have to civilians wounded or to families of civilians inadvertently killed by drone strikes?

Jus post bellum can include the responsibility of paying reparations. In the context of drones, the US has sometimes sought to compensate the families of civilians killed. For example, the Pentagon, after the botched drone strike in Afghanistan on August 22, 2021 mentioned above, offered unspecified amounts of money to relatives and proposed to help relocate those who wanted to the US (Schmitt 2021). Contrast this with the case of Adel Al Manthari, a civilian wounded in a US drone strike in Yemen who had to start a Gofundme campaign to treat his injuries (Turse 2022). The US supposedly has allocated millions of dollars in funding to compensate innocent victims, but whether and how this money is distributed is not straight-forward. Call this the *civilian casualty compensation dilemma*. How does the government determine if indeed the victim was a civilian? Is relocation feasible and if so, for whom – the immediate family? The whole family? Conversely, should the victims take US money given there might be backlash locally for doing so?

While compensation is a good idea in theory, we are left with the final question – can money ever payoff the loss of the dead or is it just a cold way to claim accountability?

5 Conclusion

In this chapter, we have explored how the ethical framework of just war has been used to guide the US use of armed drones. The *jus ad bellum* principles help determine if drone use is justified, the *jus in bello* criteria place varying levels of restraint on their use, and the *jus post bellum* themes shed some insight on the aftermath of their use. Along the way we have identified a multitude of tensions and dilemmas that arise. This is, however, only the tip of the iceberg.

In these concluding throughs, I want to highlight four paths of additional inquiry that flow from the tensions and dilemmas encountered above. The first concerns normative paradigms. The drone debates are framed by two frameworks to judge the morality of strikes outside the hot battlefield: law enforcement and just war. In my own work, I have pioneered a third middle ground framework that develops the ethics of limited force, or force short of war, to better adjudicate the moral concerns of drones (Brunstetter 2021). A second area of inquiry centers on the use of drones by other states. I have focused mainly on the US, but other states – France, Turkey, the UK, the United Arab Emirates (UAE), China, Russia, Iran, and Israel to name a few – as well as non-state actors, may use armed drones differently. Exploring what this means for world order will become increasingly important (Lushenko, Bose, and Maley 2021). A third area of inquiry follows the continuing evolution of drone technology. The advent of armed drones revolutionized warfare, and the process is far from over. The future holds the prospect of nano-drones, swarm drones, floating drone fortresses, and more (Boyle 2020). This leads directly to a fourth area of inquiry – Artificial Intelligence (AI). For the moment, there is always a human in the loop when it comes to targeting. However, there is a push for the creation of fully autonomous drones that make targeting decisions entirely on their own. The ethical debates about such a scenario coming to fruition are already heated! (Schwarz 2021)

In sum, armed drones raise age old ethical questions while also posing novel moral dilemmas. The just war moral categories are a good starting point to evaluate drone use, debate these questions, and work through the dilemmas. Perhaps this will lead to some agreement on the just and unjust uses of drones, while inevitably leading to more questions.

Seminar Questions

1. Are drones really any different than other weapons?
2. Do drones make it too easy to use lethal force?
3. Does a drone strike violate the sovereignty of the country where it takes place? What do you think the US would do if a foreign power conducted a drone strike in California?

4. Do you think civilian casualties are ever permissible in a drone strike, to take out a high-value target?
5. Can we wage a just drone war? If so, what does that look like?
6. If you think drones are too flawed of an option, what can be done instead?

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11 The CIA Drone Program

Abstract: This chapter challenges the common belief that lethal drones and the legal architecture which underwrites them emerged as a response to the September 11 attacks, instead tracing their origins back to covert CIA activities in the early 1980s. It reveals how legal restraints, technological challenges, and Cold War policies combined to enable a small group of counterterrorism hardliners within the Reagan administration and intelligence community to collaborate with private industry to create the technology and policies which would eventually come to fruition post-9/11.

Keywords: CIA, counterterrorism, Reagan, Iran-Contra, al-Qaeda, bin Laden, General Atomics

Of all the weapons in the United States' arsenal, none is more associated with the waging of the War on Terror than the armed drone. And while various branches of the US military run their own drone programs, it is the Central Intelligence Agency (CIA) that has been most involved with both the development of the doctrine of remote targeted killings, and its implementation. It was a CIA controlled Predator drone which in September 2000 first buzzed over Tarnak Farms in Kandahar, Afghanistan, as the agency utilized the recently developed unmanned aerial vehicle (UAV) in its hunt for Osama bin Laden. It was the same team which launched the world's first drone strike during the opening night of Operation Enduring Freedom on October 7, 2001, missing the intended target of the Taliban's leader Mullah Omar, but signaling the advent of a new kind of remote warfare (Woods 2015, 23–27). A year later in November 2002, the agency challenged traditional concepts of what constituted a battlespace when it oversaw the first covert targeted killing of an enemy combatant outside of a warzone with a drone strike against an al-Qaeda commander as he traveled across Yemen by car. And it was the CIA which – on the orders of President Barack Obama – pushed the boundaries of established norms of imminence and self-defense when it undertook a strike against the US citizen and al-Qaeda in the Arabian Peninsula (AQAP) preacher Anwar al-Awlaki in Yemen in 2011 (Egan 2016). Finally, it was the same agency which killed al-Qaeda's leader Ayman al-Zawahiri as he paced on a balcony in downtown Kabul in July 2022, painting the first picture of what America's post-withdrawal relationship with the Taliban-run state would look like (Pilkington 2022). Thus, the CIA's use of remotely piloted aircraft has been at the forefront of the evolution of targeted killing, developing the technology, tactics, and changing the Laws of Armed Conflict in ways which ushered in the first drone age.

Yet this close association with the War on Terror is only part of the story regarding the CIA's integral relationship to the emergence of drone warfare. While America's post-9/11 campaigns provided the backdrop and justification for the normalization of remote killings by drone, this tactic has much deeper historical roots. The CIA did not

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first adopt the concept of hunting terrorists by drone because of Osama bin Laden, nor did they begin to launch remote pre-emptive strikes on suspected terrorists purely as a response to the shock of 9/11. Instead, this chapter will reveal that the actions mentioned above are the product of a stuttering but incremental evolution dating back to the 1980s when the CIA, charged by the hawkish Reagan administration with developing a response to the rising threat of international terrorism, first began exploring unmanned systems as forms of intelligence gathering and lethal action. Furthermore, the chapter will demonstrate how shared interests in combating communists in Latin America between private sector entrepreneurs and hardliners within the national security apparatus set in motion technological developments which came to fruition during the Balkans air campaigns of the 1990s, as the United States sought to close the aerial intelligence gap that had long hampered its military capabilities. This combination of CIA intelligence gathering, private sector development, and Air Force necessity ensured that by the time the United States was looking for a way to retaliate for the attacks of September 11, 2001, drone warfare was a readily available option.

1 The Reagan Administration's Counterterrorism Hardliners

President Ronald Reagan came to office at a time when terrorist incidents around the world had increased dramatically both in frequency and lethality, rising over 300% between 1970 and 1980 (Global Terrorism Database). In response, a small group of policymakers within the administration coalesced around the idea that America needed to adopt a more aggressive stance against terrorists and their sponsors (Schultz 1984). These counterterrorism hardliners, consisting of Secretary of State George Schultz, Director of Central Intelligence William Casey, and the National Security Council staffer responsible for counterterrorism, Lt. Col. Oliver North, set out their proposals in National Security Decision Directive 138 (NSDD 138). Titled "Combating Terrorism," the directive acknowledged the phenomenon as a national security threat and called for the "pre-emptive neutralization of anti-American terrorist groups." Noticeably absent from this triumvirate of hawks was Secretary of Defense Casper Weinberger. Responsible for restoring the military's tarnished post-Vietnam reputation, as well as overseeing a military build-up intended to deter the Soviet Union from believing it could challenge a humbled America, Weinberger saw counterterrorism as a dangerous distraction. In what would turn out to be a prescient reading of events, the Secretary of Defense publicly argued that employing military force against terrorist organizations would drag the United States into unwinnable open-ended conflicts where the inevitable collateral damage from attacks against targets who shelter among civilians would undermine support and endanger the military's rehabilitation (Weinberger 1984, 1990, 54; Velasco 2011, 111). Acknowledging the Pentagon's lack of support, the direc-

tive placed responsibility for implementing this new approach with Casey's agency instead.

The CIA's first foray into its new assertive counterterrorism role did not go smoothly. Inexperienced and lacking access to the Pentagon's resources, staff at Langley reached out to Lebanon's G-2 intelligence agency to recruit local operatives who were instructed to initiate a plan to kill Hezbollah's so-called spiritual leader, Mohammed Hussayn Fadlallah. Agency analysts had linked Fadlallah to several terrorist attacks including the devastating 1983 suicide bombing of an American barracks in Beirut, which had killed 241 US service personnel and prompted President Reagan to order the withdrawal of the remaining troops from the multinational peacekeeping force which had sought to stabilize the country during its bloody civil war. The operation, initiated on March 8, 1985, was a disaster. A massive car bomb ripped through Fadallah's apartment building, killing more than 80 civilians and injuring a further 200, while missing the primary target entirely. Fadlallah's followers were quick to link the attack to the United States, hanging a huge banner in front of the blown-out building emblazoned with the words "MADE IN THE USA." Although a subsequent Senate inquiry attributed the violence to the surrogate Lebanese forces acting as "rogue agents" without sanction from their CIA handlers, Langley did not escape the affair unscathed (Woodward 1987, 397). The report's author, Bernie McMahon, a thirty-year intelligence veteran, concluded that while the CIA had not participated in the bombing, it had created a mechanism that ultimately got out of control and led to the incident (Persico 1990, 413, 428–440, 580; McFarlane 2001). The failure highlighted the unsuitability of foreign proxies for the challenging task of hunting terrorists who concealed themselves among civilians in populated areas.

The United States' faltering counterterrorism efforts prompted the creation of Vice President George H.W. Bush's Task Force on Counter Terrorism, which after a thorough review of existing practice introduced NSDD 207 on January 20, 1986 (NSDD 207). Titled "The National Program for Combating Terrorism," the directive did not introduce any new measures to what was already set out in NSDD 138, but reinforced policy positions and tightened up procedures. While NSDD 207 retained the CIA as the lead agency in planning and executing counterterrorism operations, it sought to create a greater level of fusion and cooperation on a governmental level. "The entire range of diplomatic, economic, legal, military, paramilitary, covert action and informational assets at our disposal must be brought to bear against terrorism," the document stated. In making this declaration, the Reagan administration was providing an answer of sorts to a question that had been undermining its counterterrorism efforts since it had entered office. Was terrorism a law enforcement problem or a national security issue? Should the CIA try to capture terrorists alive to try them on criminal charges in open courts, or should the goal be to kill them? NSDD 207 came down on both sides – in some cases terrorism was a legal matter, in others it was an act of war. Terrorists should be captured for trial, if possible, but that would not always be a requirement. Though NSDD 207 did not provide clarity, it at least acknowledged that the

situation was complex, and that agencies and departments would need to work together on a case-by-case basis.

The introduction of NSDD 207 was swiftly followed by the establishment of the CIA's Counterterrorist Center (CTC – it changed its name to the Counterterrorism Center in 2005) on February 1, 1986, under the leadership of its architect, Duane Clarridge. The new CTC chief was a controversial figure, recently transferred from Latin America following a political storm over a manual he was involved in producing for the agency-backed Contra rebels in Nicaragua (Brinkley 1984). Titled *Psychological Operations in Guerrilla Warfare*, the guide advocated the public killing of state officials such as court judges and police chiefs to undermine the nation's communist government and prompted an investigation by the recently established Intelligence Oversight Board over concerns of a violation of the United States' ban on assassination (CIA 1984). The ban and the oversight committees had been established by President Ford in February 1976 because of the Church Committee hearings, which had investigated a series of illegal actions undertaken by the intelligence community, identifying acts of assassination as the most egregious for the way in which they "violated the moral precepts of the United States" (Church Committee 1975, 257). Although during his election campaign Reagan had campaigned on the need to unleash the CIA, he had reiterated the ban, signing Executive Order 12333 in December 1981. Far from putting the CIA director off however, Clarridge's flirtation with assassination and willingness to work on the fringes of regulations struck Casey as exactly what was required for the counterterrorism mission. "If we're afraid to hit terrorists because somebody's going to yell 'assassination,'" he told the Senate Oversight Committee, "it'll never stop" (Persico 1990, 429; Johnson 1988, 263). "Striking at terrorists planning to strike you is not assassination, it [is] preemptive self-defense," reasoned the director, articulating the viewpoint that would later become the norm of post-9/11 drone strikes (Casey 1985, 233).

To facilitate its proactive counterterrorism efforts, Clarridge called for new legal parameters for the CIA that would enable it to undertake offensive strikes against terrorist groups worldwide, depriving them of safe havens. With the support of Casey and Robert Gates – then head of the Directorate of Intelligence (DI) – Reagan signed a highly classified finding granting the CIA the authority to do so. In addition to its more flexible remit, the CTC also departed from traditional agency structures by combining staff from the Directorates of Intelligence, Operations, and Science and Technology into what Clarridge dubbed a "fusion center." This interdisciplinary approach reflected his understanding that even aggressive counterterrorism required significant intelligence, analysis, and patience to assemble the puzzle pieces necessary to detect terrorist plots, identify leaders, and locate safe havens. Counterterrorism, Clarridge had explained in his blueprint for the Center, was "a business of minutiae – collecting bits and pieces of data on people, events, places" (Clarridge and Diehl 2002, 322).

2 First Priorities: Libya and Lebanon

The CTC's first priority was countering the continued use of terrorism as a tool of foreign policy by Libya's anti-American dictator, Muammar Gaddafi. In a speech delivered six months prior to the establishment of the CTC, Reagan declared that the United States had conclusive evidence that linked Libyan agents or their surrogates to at least 25 terrorist incidents that year alone (Reagan 1985). Moreover, there was no sign the violence was going to stop. The CIA estimated Gaddafi's influence and reach was growing as he steadily expanded his sponsorship network of terrorist agents. Sure enough, the Libyan dictator's terrorist campaign reached new levels of violence on April 5, 1986 when his agents bombed *La Belle* nightclub in West Berlin, a popular venue for American service personnel based in the Western portion of the German city (Prados 1991, 505–506). With National Security Agency (NSA) intercepts proving Gaddafi's direct involvement, the reluctant Secretary of Defense Casper Weinberger had no choice but support the retaliatory strike ordered by Reagan (Andrew 1995, 483; Weinberger 1990, 132–133). The operation, codenamed El Dorado Canyon, highlighted the difficulty of using conventional air power to attack terrorist infrastructure placed within civilian areas. Thirty-seven Libyan civilians died in the air raid, with a further 93 injured – a significantly greater death toll than the attack that had prompted the retaliation. In addition, stray munitions hit diplomatic accommodation and narrowly missed the French embassy, and two American service personnel were lost when their aircraft was shot down by Libyan air defenses. Furthermore, the raid failed to deter Gaddafi, whose regime was connected the Lockerbie bombing two years later (Prunckun and Mohr 1997; Sipress and Mintz 2003). Following the operation Clarridge mused upon the contradiction created by the US assassination ban: "Why is an expensive military raid with collateral damage [. . .] more morally acceptable than a bullet to the head?" the CTC's chief asked rhetorically (Clarridge and Diehl 2002, 339).

The second major challenge facing the CTC was the hostage crisis in Lebanon (CIA 1986). Since the summer of 1982, Iranian-sponsored terrorists had systematically kidnapped Westerners, among them numerous US citizens. President Reagan was all too aware of the political damage such a scenario could incur, having used the protracted hostage crisis which had followed the Iranian revolution in 1979 to paint his electoral rival President Jimmy Carter as feckless and weak. Thus, liberating the hostages became an obsession for Reagan and his national security team. Clarridge, channeling the CIA's new action-oriented mind-set, sought to mount an elaborate rescue mission by deploying Delta Force, America's elite counterterrorism unit, into Beirut (Coll 2004, 143). The Pentagon's generals however were still shaken by the catastrophic failure of the unit's last rescue mission, Operation Eagle Claw (Bowden 2006). The high-risk gambit to liberate the Americans who had been held hostage in Tehran for more than a year had been authorized by a desperate Carter in April 1980 but ended in disaster when two of the transports collided in the Iranian desert, causing a fireball which resulted in the deaths of eight service personnel. The intensity of the flames meant

the survivors had to retreat without their casualties, leaving the burned corpses to be discovered and broadcast to the world by the Iranians. Carter's hopes of re-election died in the desert alongside those Americans, and the incident revealed that acts of terrorism and the government's responses had the power to influence US electrical politics (White 1982, 21; Immerman 2014, 124). This created a potent tension between desperation to liberate hostages on the part of political leaders, and the military's apprehension to launch such missions. These tensions came to the fore in response to the CTC's rescue plan. Citing weak intelligence on the hostages' location, Pentagon officials rejected Clarridge's operation, insisting that there would need to be "American eyes on the target" 24 hours before any rescue operation could be launched (Coll 2004, 143). Given the inherent difficulty of penetrating terrorist organizations, combined with the United States' sparse resources in the region, this was not something the CIA was able to provide in a conventional manner. A new approach was needed.

3 Drones as the Solution

Despite the differences between the CTC's first two challenges, both shared the same solution. Following a suggestion from one of the Center's technicians, Clarridge commissioned a team of engineers to work on a highly classified pilotless drone, dubbed the Eagle Program. The prototype UAV could carry small rockets to fire at predesignated targets, striking a middle ground between large-scale bombing raids and an assassin's bullet. The team also made plans to fit the remote aircraft with explosives and shrapnel which could be used to disable Libyan military aircraft in sabotage missions. Furthermore, the drone had a reconnaissance function, being equipped with intercept equipment, an infrared camera, and a low-noise wooden propeller, enabling it to fly at 2,500 feet over Beirut to locate the hostages and coordinate a rescue mission (Claridge and Diehl 2002, 339; Coll 2004, 143–144; Fuller 2015, 783).

Despite the promise of this innovative solution, wider events conspired to ensure the CTC was never able to deploy its revolutionary counterterrorism tool, namely the breaking of the Iran-Contra affair. The multi-layered scandal was triggered by the revelation that the Reagan administration had been secretly facilitating the sale of weapons to the Islamist government of Iran as part of an effort to gain support in the liberation of the American hostages held in Beirut (NSC 1984; Byrne 2014, 158). Not only did this put the US in breach of an international arms embargo, but it also revealed a willingness to negotiate with state-sponsors of terrorism, despite Reagan's rhetorical hardline on such behavior. The crisis was compounded by the further revelation that the administration had utilized the proceeds from the illicit arms sales to fund the violent Contra rebels who were opposing the communist Sandinista government in Nicaragua – support which Congress had made illegal through the Boland Amendment due to concerns over the human rights infringements associated with

the rebels (H.R. 2968 1984). The fallout of the scandal decimated the counterterrorism hardliners, who were deeply implicated in the activities. Clarridge's roots in the Latin America desk, North's focus upon returning the hostages at all costs, and Casey's willingness to bypass regulations had combined to produce a toxic policy mix. North and Clarridge both faced prosecution and were both fired, and Casey died from a brain tumor days before he was due to testify to Congress (Clarridge and Diehl 2002, 363–386; Persico 1990, 572; Brown University n.d.). With the full consequences of the CIA's cavalier attitude exposed, the CTC's aggressive agenda vanished along with its proponents. The impact of the Eagle Program however did not end there, and in a twist of fate, the same scandal that led to the demise of its sponsor helped ensure the concept evolved into the armed drones we recognize today.

4 General Atomics' Drone Development

Impressed with the Eagle Program's applicability to military problems, Charles Hawkins, a deputy assistant secretary of defense, supported an expensive Army device designed along similar lines, only to see the project canceled as part of a sweeping Pentagon review of UAV expenditure in 1990. The withdrawal of funding was devastating for Leading Systems Incorporated (LSI), the company responsible for developing the Army's drone, which owed its creditors, Hughes Aircraft Company, $5 million. By late 1990, LSI's owner and lead engineer, Abraham Karem, had filed for bankruptcy. The gifted Israeli-American engineer and ten of his staff were saved from unemployment, however, when Hughes sold LSI's holdings, intellectual property and patents, and six experimental GNAT-750 drones to General Atomics (GA) for the cut-down price of $1.8 million (Whittle 2014, 66; Woods 2015, 31).

Why did Neal and Linden Blue, the multi-millionaire owners of GA, invest in a bankrupt and out-of-luck drone developer? The obvious answer is that the Colorado-born brothers were entrepreneurs who saw that, while military interest and investment in UAVs had diminished, it was only a matter of time before technology caught up to the vision of developers such as Karem, making it a shrewd long-term investment. Beyond business however, the Blues had their own personal with UAVs (Duhigg 2007). As ardent anti-communists, the brothers – who had started their business career running a ranch on Nicaragua's Caribbean coast – were incensed by the Soviet-backed Sandinista coup in 1979. Self-confessed "enthusiastic supporters" of the CIA's efforts to overthrow the small socialist government, the Blues instructed GA's engineers to develop GPS-equipped UAVs to launch on "kamikaze missions" to destroy the country's fuel stores while giving the US government "total deniability." GA's inexperienced engineers produced a prototype named "Predator" (Gimbel 2008). Whether their anti-communist views regarding Nicaragua ever brought the Blues into contact with Casey, Clarridge, or North is unclear. When later pressed by a journalist writing

a profile on the brothers to disclose if they had ever worked for the CIA, they understandably declined to discuss the matter, but given their contacts, resources, and hostility toward the Sandinista government it is certainly plausible. Ultimately the drone plan come to nothing as a combination of the prototype's poor design, combined with the fallout of the Iran-Contra scandal prevented the UAV's deployment. The setback was only a temporary hindrance for the Blue's ambitions, however. By acquiring Karem's designs and employing the visionary aeronautics engineer, the entrepreneurial brothers ensured the newly formed General Atomics Aeronautical Systems Inc. (GA-ASI) was at the forefront of UAV design and ideally placed to address the emerging intelligence challenge of the post-Cold War age.

As the collapse of the Soviet Union stripped away the superpower competition which had justified the United States' enormous global military presence, the George H. W. Bush administration recast America's role as the enforcer of a "new world order" based upon the international laws of the United Nations Charter (Bush 1991). The 1990 Persian Gulf war had provided the perfect opportunity to demonstrate the implementation of this new order, while justifying America's continued preponderance of power. In the wake of the successful intervention, Washington elites coalesced around a new consensus that the United States had a strategic interest and moral obligation to use its power to sustain international stability. While economic matters ensured that Bush only served one term, his successor, Bill Clinton, continued the post-Cold War triumphalism and global commitment to enforcing international law (White House 1994). Thus, when the United Nations leadership, unable to stop the carnage that had been unleased following the breakup of the former Yugoslavia, formally requested the North Atlantic Treaty Organisation's (NATO) military support, the Clinton administration agreed (Brzezinski 2007, 116–117).

Keen to avoid a ground campaign, the plan was to utilize NATO's predominantly American airpower to break what had descended into the siege of the Bosnian capital of Sarajevo and force the attacking Bosnian Serb Army to the negotiating table (Holbrooke 1999, 102). But American planers suffered from a scarcity of information regarding events on the ground around the city. Weather conditions over the mountainous Bosnian territory hampered American reconnaissance efforts, with the cameras mounted on the Pentagon's network of spy satellites and older U-2 aircraft unable to penetrate the cloud cover (Whittle 2014, 71). The problem was compounded by the Serb's Russian-manufactured air defenses which made low-level aerial scouting extremely dangerous (Clines 1995). Serb artillery crews, whose weapons pounded the besieged city, also employed simple but effective counter-surveillance measures, changing their firing positions and concealing their weapons in barns, woodland, and dense foliage during the short periods each day they knew America's satellites would be orbiting overhead. Despite arguably having the most dominant military that had ever existed, this aerial intelligence gap had been troubling American forces since Vietnam, and if airpower was going to be the tool of American peacekeeping in the post-Cold War world, it had to be addressed (Rosenau 2001, 33).

Clinton ordered his recently appointed and technically minded Director of Central Intelligence, James Woolsey, to find a solution to the intelligence gap, and once again when faced with a seemingly intractable problem, the agency turned to drones. Aware of GA-ASI's work on unmanned aircraft, Woolsey reached out to Karem and his engineers (Whittle 2014, 70). Bypassing the Department of Defense's slow and cumbersome development and procurement cycle, staff from the CIA's Directorate of Science and Technology (DST) who had been working on drone technology since the CTC's first prototype, combined their expertise with Karem's team (Strickland 2013, 1–6). Taking advantage of the growing connectivity between maturing technologies such as greater UAV endurance, improved satellite communications and GPS accuracy, and high-resolution live video feeds to deliver powerful new surveillance tools, the group rapidly developed GA-ASI's basic GNAT-750 drones into fully functional remotely piloted surveillance drones which were swiftly deployed above the skies of Sarajevo in an operation codenamed LOFTY VIEW in 1994 (Pike 1999).

5 "The Next Logical Step" – Weaponizing the Predator

Recognizing LOFTY VIEW as a successful proof of concept the Pentagon's Defense Advanced Research Projects Agency (DARPA) awarded GA-ASI a contract to develop a more advanced version of the GNAT 75, capable of operating at a further distance, greater altitude, and longer duration, while providing a higher resolution feed. Reviving the name of the Blue brother's first drone, GA's "Predator" was completed by June 1994. The upgraded UAV was swiftly deployed back to the Balkans in support of Operation Nomad Vigil in 1995, and again in 1996 as part of Operation Deliberate Force, an intense NATO bombing campaign against Serb forces (Mazetti 2013, 90–91; Whittle 2014, 81–82; Yenne 2010, 39). In a move which signaled a shift in responsibility for the United States' expanding drone fleet, both operations were overseen by the US Airforce, not the CIA. Continuing this direction of travel, in 1997 the House Intelligence Committee ruled that all functions related to the Predator UAV be transferred to the Air Force, which assumed control on October 1 that year (H.R. 1775, 1998).

While the CIA's sidelining temporarily marked the cessation of the agency's involvement in the drone program, the Air Force's decision to pass responsibility for further drone evolution to the 645th Aeronautical Systems Group – otherwise known as Big Safari – helped move the UAV closer to the original vision of an armed UAV that the CTC's Eagle program prototype had introduced a decade prior. A small unit staffed by specialized engineers and technicians, Big Safari's mission is to exploit existing technology and produce high-tech solutions to defense challenges, typically by working in unison with its contractor partners (Grimes 2014, 329). In cooperation with GA-ASI, and Raytheon – the manufacturers of the Predator's sensor ball and camera –

the team upgraded the Predator to carry a laser designator which could guide ordinance from other Air Force aircraft accurately to targets. On June 2, 1999 in what was more a test than an act of war, a WILD (Wartime Integrated Laser Designator) Predator successfully guided a 500-pound bomb from a USAF A-10 Warthog onto a shed in the Kosovo countryside (Whittle 2014, 141–142; Woods 2015, 36). The WILD Predator did not play a part in the air campaign itself; Serb forces surrendered shortly after the successful test, agreeing to peace terms the following day. Once more however, the Balkans had served as an ideal proving ground for the evolving concept of drone warfare. Impressed with what he had seen the Predator do during his command of the Kosovo air war, the recently appointed chief of the Air Force's Air Combat Command (ACC), Commander General John P. Jumper, decided to act upon a suggestion put to him by Major General Michael C. Kostelnikm, head of the Air Armament Center, and his deputy, Brigadier General Kevin Sullivan, that the Predator could serve as a perfect platform for laser-guided smart bombs. On May 1, 2000, Jumper sent an announcement to the Air Force Chief of Staff, the Secretary of the Air Force, and other top service leaders, reporting that, having "internalized the Predator lessons from Operation Allied Force" the ACC was "moving out on the next logical step for USAF [United States Air Force] UAVs using Predator – weaponizing UAVs" (Whittle 2014, 163–170). Within a month, Big Safari's engineers had identified a missile they believed suitable for launch from the drone's flimsy wings – the Army's AGM-114 Heliborne-Launched Fire-and-Forget Missile commonly known as Hellfire – and set about trying to adapt the Predator and missile to meet Jumper's ambitious goal (Grimes 2014, 331–332; Whittle 2014, 172).

6 The Hunt for bin Laden

In early 2000, Admiral Scott Fry, director of operations for the military's Joint Staff, recommended the Predator to Charles Allen, the assistant director of Central Intelligence for collection, as a potential "game changer" in the agency's search for Osama bin Laden within Taliban-controlled southern Afghanistan (Whittle 2014, 145). Allen, who had formally headed the CTC's hostage-locating task force back in 1986, immediately appreciated the possibilities afforded by the drone, and proposed the agency acquire the Predator (CIA 1986). Ironically, when Richard Clarke, Clinton's counterterrorism adviser, drew up the "Afghan Eyes" plan, CTC staff resisted, describing the UAV, in Clarke's words, as "Too Risky. Too costly. Too not-invented-here" (Clarke 2004, 220) The success of the initial Predator flights quickly removed such doubts, as the drone filmed bin Laden at his Tarnak farm compound on two separate occasions (Bergen 2011, 45; Woods 2015, 39). Having successfully managed to get American eyes on the target, Clarke pushed for the deployment of the armed variant of the aircraft that the Air

Force was developing to provide what he described as a "see it/shoot it" option by March 2001 (Clarke 2000, 8).

Despite Clarke's spring timeline, a range of factors prevented the deployment of an armed Predator over Afghanistan prior to the September 11 attacks. Technical challenges related to a lightweight airframe designed for high endurance, not weapon bearing, posed the Air Force's specialist Big Safari engineers the challenge of launching missiles without ripping the drone's own wings off (Whittle 2011, 20–21). The fragile and experimental nature of the drone, and the consequent need for repairs prompted a budgetary row between the Air Force and CIA, with, in hindsight, the measly sum of $3 million dollars further delaying the project and prompting direct budget amendments from the Clinton White House in the summer of 2000 (White House 2000; 9/11 Commission 2004, 506). A legal debate with the State Department over the risk of the weapon platform violating the terms of the Intermediate-Range Nuclear Forces Treaty caused further delays (Department of State 1987; Clark 2000). On different legal grounds, CIA Director George Tenet argued it would be a "terrible mistake for the CIA to fire the weapon," which risked dragging the agency back into the illegal business of assassination (Gellman 2002; Mayer 2009).

The lack of interest among the George W. Bush administration with the matter ensured the armed drone remained grounded past Clarke's March deadline. In the first principal-level meeting regarding al-Qaeda, held on September 4, 2001 – eight months after Clarke first requested the gathering – Bush agreed to deploy the armed Predator, but deferred the thorny issue of who would fire the missile (Clarke 2001; Benjamin and Simon 2003, 345–346; Windrem 2013). In the aftermath of 9/11, the potency of the resistance of those concerned about the CTC's role in piloting lethal drones could not stand the pressure for retribution. The bureaucratic deadlock was broken on September 17, 2001 when Bush signed a finding that created a secret list of high-value targets that the CTC was authorized to kill, thus restoring the CTC to the aggressive role its founder and his hardline supporters intended (Gow 2001; Williams 2013, 28; Rizzo 2011).

7 Full Circle

As this chapter has demonstrated, the CIA was integral in the emergence of the first wave of drone warfare. Searching for a solution to the challenge of targeting terrorists that hide among civilians, the difficulties associated with locating hostages held in inaccessible territory, and the prevailing issue of plugging the United States' aerial intelligence gap all separately drove different elements of research and development which ultimately culminated in the emergence of the armed Predator drone.

The CIA's support for the Contras served as a magnet for hardliners willing to operate on the fringes of US law. While initially united in their Cold War focus, these

figures were far-sighted in their realization that a new wave of terrorism was emerging which posed a national security threat that the United States was poorly equipped to address. The close personal connections formed through the CIA's activity in Latin America helped knit together a network of individuals who were motivated and well placed to act upon the growing pressure to address the increasingly professionalized and dangerous terrorist threat. The fallout from the policy that had helped unite these hardliners however dramatically undermined their agenda. The stripping out of talent that followed Iran-Contra combined with a range of other factors over the next decade from dramatic budget cuts, the Aldrich Ames case, and Deutch rules, to see Clarridge's original war room vision transformed into a risk-averse organization later criticized by the 9/11 commission (9/11 Commission 2004, 133). Yet it was backing for the Contras, too, which first brought the Blue brothers into the drone business. Without these entrepreneurs, it is unlikely Abraham Karem's version of the Eagle Program would ever have seen completion.

Regarding the Eagle Program's two primary goals, drones came to play a key role in rescuing hostages, with captives such as Captain Richard Phillips, Jessica Buchanan, and Helen Johnstone liberated by US Special Forces with the aid of intelligence gathered from UAVs (Axe 2012; White House 2012; Rayment 2012). Concurrently, the adoption of this proactive approach has at times resulted in the deaths of captives. Linda Norgrove, Luke Somers, and Pierre Korkie all perished because of rescue operations gone wrong. In a tragic twist, two Taliban captives, Warren Weinstein and Giovanni Lo Porto, were killed along the Afghanistan-Pakistan border by an errant CIA drone strike (BBC 2010; Fahim and Schmitt 2014; White House 2015). Such misfortunes reveal the very real risks of the proactive approach Clarridge endorsed. Yet in political terms, while the White House has had to issue condolences to the families of lost loved ones, drones have helped presidents avoid the maddening powerlessness that caused two previous occupants of the Oval Office to enter negotiations with terrorists and their sponsors.

As for the counterterrorism program's first target – Gaddafi – Clarridge's vision came full circle in 2011 when armed Predators were deployed to Libya as part of the NATO support to rebel forces following the uprising against the dictator. On the morning of October 20, Gaddafi, while attempting to slip out of his compound in Sirte, was set upon by a loitering Predator (Fahim, Shadid, and Gladstone 2011). The drone, accompanied by a French warplane, attacked the convoy, scattering the vehicles and leaving Libya's deposed leader sheltering in a culvert, where rebel forces captured and killed him shortly afterward.

Alongside the reconnaissance and precision strike capabilities, there is also evidence that the kamikaze utility of drones imagined by both the CTC's engineers and the Blue brothers, has also come to fruition. In Ukraine, custom-made drones have been employed to haul high-explosives to Russian ammunition dumps and airbases, landing on targets before detonating their payloads, while loitering munitions such as the US Defense contractor AeroVironment's Switchblade – a drone designed to be lin-

ger in the air before being guided to targets – have been key exports (Axe 2022; McLeary and Ward 2022).

Thus, the origins of lethal drones do not lay in the overly militarized response to the shock of 9/11, nor as the product of a specific technological innovation. Instead, the first wave of drone warfare came about as the product of the CIA's efforts to address three distinct challenges: American security officials' long-held desire to preemptively neutralize foreign terrorist threats while avoiding the collateral damage of air strikes and the moral ambiguity of assassination; Presidents concerns over the political ramifications of drawn-out hostage crises; and the need to provide better aerial intelligence as the United States adopted a post-Cold War role of global policing through the prominent use of airpower.

Seminar Questions

1. What were the two competing visions regarding the threat of terrorism in the Reagan administration, and how did these come to be reflected post-9/11?
2. Why did the use of proxy forces to conduct counterterrorism operations prove so problematic for the United States?
3. What made the CIA's Counterterrorist Center so unique?
4. What was the appeal of Eagle Program to the CIA?
5. Did the anti-communism fervour of hawkish Cold Warriors such as Casey, North, Clarridge and the Blue brothers ultimately aid drone development, or set it back?
6. Was the delay in deploying an armed drone in the hunt for bin Laden predominantly a technical, legal, or political issue?

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Aditi Gupta and Camilla Molyneux

12 Drones and Civilian Harm

Abstract: Playing a central role in driving military doctrine and tactics, drone warfare has had an enduring impact on perceptions of the traditional boundaries and limitations of war. The majority of studies have focused on drone warfare as a phenomenon, centering on states, militaries, and armed actors. However, this abstract, top-down focus largely neglects the human experience, limiting knowledge and understanding of drone warfare and erasing the devastating human cost this type of warfare has wrought. This chapter aims to bridge this gap by outlining how states' pursuance of drone warfare actively erodes civilian status, leverages the cracks that exist in a fragile regime of rights, and has resulted in states sidestepping acknowledgment, recognition and accountability for extensive civilian harm across conflict zones, preventing protection from being meaningful. In addition, drawing on field research, available data and reporting, the chapter will examine how we can better understand the full spectrum of civilian harm, and the importance of civilian harm prevention, mitigation and recording.

Keywords: Civilian protection, critical military studies, drone warfare, human experience, international humanitarian law, conflict

1 Introduction

More than merely an aircraft, remotely piloted aircraft systems – commonly referred to as 'drones'[1] – represent the tip of a complicated system of integrated intelligence gathering, surveillance, and targeting capability that straddles intelligence and military bodies, often involving multiple states. The use of armed drones in particular has electrified policy discussions on law, ethics, and military strategy, whilst drone technology over the past two decades has spread rapidly and widely. Playing a central role in driving military doctrine and tactics, drone warfare has had an enduring impact on the traditional boundaries and limitations of war, undercutting the concepts by which war is conducted, monitored, and understood. Whilst there has been a flurry of studies examining the use of drones, the majority of studies have focused on drone warfare as a phenomenon, centering on states, militaries, and armed actors. However, this abstract, top-down focus is "emptied of human content" (Scarry 1987, 70), limiting knowledge and understanding of drone warfare as human experience,

1 The military preference is for the term 'remotely piloted aircraft' (RPA), which refers to the aircraft itself, and 'remotely piloted aircraft system' (RPAS) referring to the aircraft, together with the operator and system that supports it.

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and erasing the devastating human cost this type of warfare has wrought in its path. This chapter aims to bridge this gap by outlining how states' pursuance of drone warfare actively erodes civilian status, leverages the cracks that exist in a fragile regime of rights, and has resulted in states sidestepping acknowledgment, recognition and accountability for extensive civilian harm across conflict zones, preventing protection from being meaningful.

2 The Neglect of Human Experience in Studies of Drone Warfare

In today's modern conflicts, drones are one of the most significant tools and visible aspects of the shift to more remote methods of warfare. Western state-led operations have increasingly shifted away from "boots-on-the-ground" deployments in favor of light footprint military interventions (Watson and McKay 2021) that involve the use of drone and airstrikes, special forces, intelligence operatives, private contractors and military-to-military training teams (Watts and Biegon 2017, 1).

The June 2020 report of the UN Special Rapporteur on Extrajudicial Killings warned powerfully that "drones are a lightning rod for key questions about protection of the right to life in conflicts, asymmetrical warfare, counter-terrorism operations, and so-called peace situations. With their lot of unlawful deaths and arbitrary killings, they are also revealing of the severe failures of national and international institutions mandated to protect human rights, democracy, peace and security" (Callamard 2020, 4).

Indeed, drones have played a central role in driving military doctrine over the past two decades. Their use by the US in particular has contributed to hotly contested expansive state interpretations of international law that many argue violate established limitations on targeting and the scope of the battlefield, both in temporal and spatial terms (APPG on Drones 2018). This shift has up-ended traditional notions of armed conflict where force is permitted within clear geographical boundaries, against specific parties, after a tangible threat has been determined. Furthermore, the adoption by the US of a looser definition of an enemy combatant, had critics warning of the increased risk to civilian life due to the test for when someone could be targeted, the required level of certainty that no civilians were present, and that you had the right target, lowered (APPG on Drones 2018). This has resulted in the sharp increase of strikes and operations undertaken by the US outside of armed conflict, repackaged as "areas of active hostilities" (Turse 2020) – and accompanied by a huge rise in civilian deaths without accountability.

This shift away from geocentric and temporally defined conceptions of war has resulted in confusion; not just in terms of the "lines of responsibility" of actors (Demmers and Gould 2018, 365), but when war – as societies understand – begins and

ends. Without clear lines determining when and where conflict starts, this blurs the lines between war and peace, undercutting the concepts by which war is conducted, monitored, and understood. In this way, "the conventional ties between war, space and time have become undone" (Demmers and Gould 2018, 366) and the increasing studies on drones and modern warfare may be seen as attempts to understand the nature and implications of this shift.

The majority of studies to date, however, have focused on warfare as a phenomenon. This involves the study of war through abstract notions of the state, militaries and insurgents; and in articles focusing primarily on top-level impact, culminating in analyses of governance, institutions, militaries, and legal frameworks. This largely abstract focus is where most analysis of drone warfare, particularly, stops, and rightfully so when the aim is to study the unique elements of drone warfare as a phenomenon in its own right.

However, this abstraction and solely top-down analysis is "emptied of human content" (Scarry 1987, 70). It misses nuances around what drives the continuation of drone warfare's tactics and logic. Holmqvist (2013, 3) powerfully argues that "in terms of human experience [. . .] fighting always exceeds fighting," whilst feminist critiques call for the re-centering of the study of war as bodily injury and experience (Scarry 1987; Sylvester 2012; McSorely 2012). For instance, bombardment cannot only be understood as physical destruction inflicted, but must include "the impact on human lives [. . .] psyches, thoughts and emotions" (Holmqvist 2013, 3). To fully understand the impact of drone warfare and this technology's part in the advancement of remote warfare, it is vital we bridge this gap by examining and addressing human experience on the ground. Whilst there is not scope in this article to define humanity in its entirety, in the context of studying warfare, a useful place to start is by examining the experience of the 'civilian' in war.

2.1 What Does It Mean to Be a Civilian in Today's Conflicts?

A key safeguard for individuals in both wartime and peacetime is the designation of 'civilian' status, protecting them from arbitrary killings and violence. Studies analyzing civilian status in warfare largely see this category as a legal concept that governs the conduct of parties in warfare. However, as civilian immunity is not absolute, a top-down legal focus is not sufficient on its own. In order to bring together the multiple facets of the notion of the 'civilian,' it is important to use an interdisciplinary lens, drawing together existing scholarship on what makes us fundamentally *human* and worthy of protection. Humanity, via protected civilian status, is designated through three key ways which help to define what makes a civilian visible in the eyes of the international system, and so worthy of protection:

1. The legal protections which define a civilian from a policy perspective;
2. The bestowal of these rights by states which affords people their humanity and value; and
3. State efforts to control the visual and narrative dimensions of war which delimits public discourse and overall understanding of what constitutes a civilian.

2.2 Legal Foundations of Civilian Status

The protection of civilians has been a central legal principle underpinning modern warfare, codified and enshrined in the Geneva Conventions, multiple treaties, and in customary law. 2019 was the 70th anniversary of the adoption of the Conventions – the most extensive codification of the laws of war, and the only treaties to have been ratified by every state in the world (Gillard 2020). Civilians are broadly protected from harm in war through the upholding of the legal principles of distinction, proportionality, and necessity. As outlined by Crawford (2018), enshrined in treaty and customary law applicable in both international armed conflicts (IACs)[2] and non-international armed conflicts (NIACs)[3] are detailed rules, including those prohibiting direct targeting of civilian objects and infrastructure, obligations to ensure civilian elements are protected from direct effects of military operations,[4] and rules determining treatment of civilians at the hands of any adversary.[5] Primary among these rules protecting civilians in armed conflict is the principle of distinction: the fundamental obligation on parties to distinguish between civilians (and civilian objects) and military objectives and to direct attacks only against military objectives.[6] This all, of course, hinges on the necessity of decisively identifying civilians from combatants and clearly determining the existence of an armed conflict (Crawford 2018).

2 The substantive treaty law regarding the protection of civilians in IACs can be found in the four Geneva Conventions of 1949 and Protocol I, Additional to the Geneva Conventions (Protocol I or AP I).
3 The substantive treaty law relating to NIACs comprises Article 3 to the Geneva Conventions (known as Common Article 3) and Protocol II Additional to the Geneva Conventions (Protocol II or AP II).
4 These include rules on proportionality in attack (contained in Art 51(5) AP I), prohibitions on indiscriminate attacks (Art 51(4) AP I), and obligations on parties to take precautions in attack (Art 57 AP I) and in defense (Art 58 AP I).
5 Contained in Geneva Convention IV, regarding the treatment of civilians under belligerent occupation.
6 Article 48 of AP I provides that: “[I]n order to ensure respect for and protection of the civilian population and civilian objects, the parties to an armed conflict shall at all times distinguish between the civilian population and combatants and between civilian objects and military objectives. Accordingly, they shall direct their operations only against military objectives.”

2.2.1 The Precarity of Legal Protections

The Geneva Conventions, subsequent treaties, and their Additional Protocol in 1977 are held up as pinnacles of international solidarity and humanity. But in reality, the status of the civilian is far more tenuous. First, the civilian in warfare is not defined as a positive legal entity in its own right – instead, it is defined in terms of the negative space left by who is defined as a combatant (Crawford 2018). This is significant because civilian immunity is not absolute. Plus, it is important to remember first and foremost that civilians can legally be killed in armed conflict if those casualties can be classed as collateral damage. The principle of proportionality is key to this determination; however, it depends on completely speculative ex ante assessments of the expected humanitarian effects of an attack and asks military actors to balance the rights of civilians with the interests of the armed forces. Cohen (2018, 76) writes persuasively, that not only are these concepts incomparable, but this judgment is also based on totally subjective risk assessments that will differ widely from party to party.

Furthermore, immunity from targeting is contingent on civilians refraining from directly participating in hostilities. As outlined in Article 51(3) of Additional Protocol I, civilians are not to be made the object of attack[7] "unless and for such time as they take a direct part in hostilities" (Crawford 2018). This form of negative definition becomes more vulnerable still when applied to complex conflicts involving multiple non-state actors. This is because, according to McDonald (2017, 173), "the individuals that take up arms against states in non-international armed conflicts do not gain a formal legal status like combatants in state armies; instead, as individuals, they are defined by their collective loss of protections associated with being a civilian." This double-negative definition places both the civilian and the non-state combatant in the same fluid definitional space – one which relies on the judgment of state and non-state parties to a conflict to determine and uphold.

2.3 Power Relationships between Civilian and State

By looking at the civilian through its legal manifestations, we can see that the debate on who constitutes a civilian – and so worthy of protection – is complex; but more importantly the legal status itself is fragile. Importantly, the power to both bestow this protected status, as well as responsibility to uphold these protections lies squarely in the hands of states. As posited by Cohen (2018, 79) "it is the state, and only the state, that is the focus of efforts to implement and enforce international humanitarian law (IHL)" whilst "non-state actors in conflicts are largely seen to violate IHL, or ignore it altogether" (Schmitt 2008, 62). This means that upholding the foundational principles

7 AP I, Art 52(2).

of distinction, proportionality, and necessity that underpin protection in warfare relies primarily on the subjective judgment of states.

By bringing together the ideas of Arendt on the relationship between humanity and legal rights, and Agamben's (2008) writings on sovereign power and bare life, we can see that in warfare the power relationship between states and civilians is fundamentally unequal. The paradox of being provided rights and protections in warfare is that without them, the civilian in war is rendered effectively sub-human and powerless.

Arendt's sharp analysis (1973) of the plight of refugees and stateless individuals seeking protection after World War II highlights two important forms of legal protection in this space; those based on universal abstract rights, and those granted by a state to its citizens:

> If a human being loses his political status, he should, according to the implications of the inborn and inalienable rights of man, come under exactly the situation for which the declaration of such general rights are provided. Actually, the opposite is the case. It seems that a man who is nothing but a man has lost the very qualities which make it possible for other people to treat him as a fellow human being. (Arendt 1973, 300)

Building on Gündoğdu's thesis (2012), "the more we invoke rights, the more we become entangled" in what Agamben calls sovereign power where in the same breath law (and the protections it affords) is provided – it can be withdrawn from a human being (Lechte and Newman 2013).

This becomes a problem when we rely on the same sovereign power to decide who deserves protected status as a civilian in armed conflict and peacetime. Civilians require states, as sovereign powers, to uphold their protections through enforcing universal human rights, or through the subjective judgment required to guarantee the principles of distinction, proportionality, and necessity. In dire situations, such as famine or war, the aim in the first instance is to enable the bare survival of those individuals: "mere aliveness is the only aim regardless of any concern about the power relation" (Lechte and Newman 2013, 21).

With legal obligations establishing a duty of care by states to protect civilians in situations of conflict, this element of control translates into a fundamentally unequal power dynamic capable of reducing civilians to "an irrelevant form of bare life, incapable of political agency or autonomous action" (Lechte and Newman 2013, 11). Therefore, to be deemed human, and not a form of bare life, depends on a combination of sovereign authority and legal status beyond those afforded by abstract universal rights. Whilst it is through rights that individuals are included in the civil sphere as citizens, in the context of drone warfare this inclusion coincides with a growing erosion of rights, and a readiness on the part of the state to sacrifice them in the name of security (Lechte and Newman 2013, 7).

2.4 How Do We Decide Which Life Is Grievable?: Framing the Civilian

Agamben's thesis therefore helps us to pull out the relations of power that are present between states and civilians in warfare. It shows us that the dynamic is fundamentally unequal, and civilian protection depends on a combination of sovereign authority and legal status – both of which are fragile, subjective, and are at the mercy of state discretion. The civilian nevertheless occupies a primary position in society, with expectations of protection embedded in the concept. The civilian, though disadvantaged in terms of power, has been made undeniably visible in society, particularly since World War II. To understand on what terms this visibility lies, it is important to explore more deeply – *how* is the civilian made visible in this space? To aid this analysis, we will outline Judith Butler's (2016) ideas of how "grievable life" is framed and formed, and the implications this has for the category of civilian.

According to Butler (2016), in warfare lives are either seen as grievable and worthy of protection – or not. War seeks to distinguish those lives to be preserved from those whose lives are dispensable. Military advantage in warfare is predicated on increasing the precarity of one side, and decreasing it on the other, albeit in a manner that is seen as 'just.' The tactics deployed in warfare, therefore are governed by normative codes, most prevalently international law, as outlined above. Butler argues international law presupposes a 'clean' war where no civilians are killed is possible. However, decades of warfare shows us this is rarely true. Civilians are always killed, most often legally as collateral damage.

She argues that the process of 'framing' is essential to the creation and maintenance of the 'civilian' as a stable category for protection; as well as determining who falls within this protected category. Such visual and conceptual frames are presented as a way of building and destroying populations as objects of knowledge and targets of war. Affected populations are therefore framed by the narratives, techniques, and tactics used in war, as "living humans become cast as instruments, blockades, shields and targets" (Butler 2016, x). The concepts of collateral damage and the civilian, are therefore intimately linked, and subject to how they are framed.

Frames "do not simply exhibit reality, but actively participate in a strategy of containment, selectively producing and enforcing what will count as reality" (Butler 2016, xiii). In drone warfare, the frame initiates (through weaponry), and finishes off (via reporting) a multitude of violent deeds. Its success and ability to continue, however, is based on successful conscription of the public to support what is done in their name. This is where Butler argues frames are crucial to the continuance of any type of warfare: "when populations become implicitly framed as targets for destruction within ordinary discourse, then the frame solicits our complicity with this practice of the visual and discursive normalisation of war" (Butler 2016, xvii). Most powerfully, Butler argues that these frames seek to institute an interdiction on mourning in warfare – there is no destruction, there is no loss, and therefore no outrage or opposition. Cen-

tral to this, is the framing of civilian populations in drone warfare as "duplicitous shrapnel" – "part of the defensive and manipulative machinery of war," and regarded as "no longer living," but instead, a threat to life (Butler 2016, x). If we agree that it is unacceptable to kill civilians in war (and decades of just war theory and international law consensus would agree), then what civilian protection depends on in warfare is the ability to "apprehend as 'living' those targeted populations" (Butler 2016, xix)

Thus far, this chapter has highlighted how states' pursuance of drone warfare has developed new legal interpretations of the already fragile rules that govern the use of force whilst eroding the protections that currently exist. This has been done to enable drone strikes to be conducted with more frequency and less checks and balances, at the cost of civilian protection. Furthermore, this chapter has demonstrated how the current protections offered to civilians in conflict are incredibly fragile, highlighting how the pursuance of drone warfare leverages the cracks that exist, preventing these protections from being meaningful. Whilst legal protections provide the foundation for civilian protection – these protections are not enough on their own. It is clear that the power relationship between states and civilians is fundamentally unequal, leaving civilians at the mercy of state decision-making. In addition, efforts to discredit civilians in conflict zones and frame them as legitimate military targets in the eyes of society have gathered pace, exposing the substantial gaps and shortcomings in current mechanisms for accountability and remedy.

The second half of the chapter will examine the application and detrimental effect of the dismantling of protections for civilians in conflict zones. It will highlight the disparities between states' understanding of the harm they have caused, and the view from the ground. This includes shining a light on harm beyond civilian casualties, underlining broader and long-term human and societal harm not adequately protected in existing legal frameworks. This, we hope, will emphasize the urgency for further protection through legal, policy, and operational reform.

3 Understanding Civilian Harm

3.1 Unacknowledged Civilian Harm

Today, civilians represent up to 90% of conflict-related deaths (UN Secretary-General 2022; UNSC 2022). Over the past 70 years, the numbers of civilians killed as a proportion of conflict-related deaths has increased exponentially, from 50% during World War II, to today's unprecedented figures (Adamczyk 2021). This is partly due to the changing character of war; more frequently fought in urban areas, among civilians, and with wide-area explosive weapons (UN Secretary-General 2022). Despite acknowledgment by the UN and renowned NGOs of the significant proportion of civilian casualties in modern conflict, civilian casualties remain significantly undercounted by

states across conflict theaters (New York Times n.d.; Fisher 2020). Where force is deployed remotely, including by drone, militaries seem particularly poorly equipped to account for harm (Oakford 2018).

States' inability to acknowledge, recognize, and record civilian harm, does not mean harm doesn't exist. Activists and survivors on the ground, as well as human rights and independent monitoring organizations, have for decades criticized states' unrealistically low civilian casualty numbers, and the process by which these are calculated (e.g., see Airwars live database). The US-led Global Coalition Against Daesh is merely one example. The significant gap between the estimated civilian deaths recorded by independent monitoring organizations and that of the coalition itself speaks to states' shortcomings pertaining to investigating, monitoring, and recording civilian harm. Airwars, a leading, independent monitoring organization, estimates the coalition has caused between 8,198 and 13,256 civilian deaths (Airwars, live database, July 2023). The coalition's own estimates, however, stand at 1,437 (Airwars, live database, July 2023). It is noteworthy that the majority of civilian deaths acknowledged by the coalition are based upon investigations (documentation and evidence) conducted by Airwars, drawing on open-source material and working on a shoestring budget.

3.2 Drone Strikes and Civilian Casualties

The lack of a considerable personnel presence on the ground – one of the significant benefits for states deploying drones – has influenced the way in which civilian casualties are investigated and acknowledged by the US and UK in Syria and Iraq. In absence of boots on the ground, any post-strike assessment is conducted from the air, leaving out intelligence that might be gleaned from on-the-ground observations and conversations with survivors and witnesses. Relying on aerial footage only is especially problematic in an urban setting, where the majority of casualties will be buried under rubble, and thus not visible from the air. Furthermore, the use of explosive weapons in urban areas are likely to damage buildings beyond the intended target, increasing the risk of larger numbers of civilian casualties. The UK's contribution to the anti-Daesh coalition illustrates these shortcomings particularly well. Despite having dropped more than 4,300 munitions on largely urban areas – the majority of which weigh 500 lbs – the UK has only confirmed killing one civilian (Graham-Harrison and Dyke 2023). This, it admits, does not mean that more civilians have not died; indeed investigations by the US have found that the UK has killed more civilians (Karlshoej-Pedersen 2021). Instead, it means that whatever evidence the Ministry of Defence has seen, fails to meet its "exceptionally high bar set for determining civilian harm" (Karlshoej-Pedersen 2021). The UK's current standard, according to senior British defense officials, is similar to the "beyond reasonable doubt" standard used by British courts (Karlshoej-Pedersen 2021). This is particularly problematic, considering the UK does not have an institutional process by which it systematically investigates

civilian harm, relying instead on ad hoc investigations (Karlshoej-Pedersen 2021). By contrast, the US does have such a process (Woods 2020). However, as repeated media revelations and civil society investigations have shown, it is riddled with flaws (Airwars, live database 2023; New York Times n.d.).

Recent use of airpower – by drone and manned aircraft – in particular aerial campaigns by the US and its allies, have been justified by claims that they are the most precise in history. Whilst it is true that history's most precise munitions exist today, these are not the only munitions in use, nor do their use automatically equate to successful precision targeting. A so-called 'precision strike' is only as precise as the intelligence that informs it. And, according to a growing body of evidence, flawed intelligence and confirmation bias regularly inform air strikes (Human Rights Watch et al. 2022). Recent revelations by the New York Times showed a pattern of poor intelligence and targeting causing civilian harm in US air strikes across Afghanistan, Iraq and Syria (New York Times n.d.). Civilians are also repeatedly misidentified as combatants, contributing to the unrealistically low civilian casualty numbers (New York Times n.d.), not to mention significant grief for those left behind.

3.3 Civilian Harm Prevention, Mitigation, and Recording Is Good Military Strategy

Considerable civilian harm will have a negative effect on military objectives. In an era where the central military objective has been to defeat extremist groups and prevent them from taking hold in the local population, civilian harm can have the opposite effect. Indeed experts have repeatedly warned that civilian harm is used by extremist groups to pit civilian populations against the US and its allies (Sales 2022; Jenkins 1985). Even where civilian harm may be legal under international humanitarian law – adhering to the principles of proportionality, distinction, and necessity – it is in the utmost interest of the state to prevent and mitigate civilian casualties, but also essential infrastructure, the well-being of civilian populations and to avoid military action with significant reverberating effects.

3.4 Harm beyond Casualties

A growing body of evidence has outlined a broader spectrum of harm experienced by civilians in conflict. This extends beyond death and injury, encompassing significant psychological harm, harm to people's livelihoods, and children's education (Shiban and Molyneux 2021; Stanford Law School and NYU School of Law 2012). Furthermore, conflict, and the destruction of essential infrastructure in particular, can have drawn-out reverberating effects, lasting decades after the end of a conflict. Restricted by space limitations, this chapter will only briefly touch upon civilian harm beyond casu-

alties, by highlighting some of the findings in a field that desperately requires more research.

From Afghanistan to Yemen, research has found that the use of military drones – in particular drone strikes and frequent intelligence and reconnaissance flights – has caused significant harm to local communities' mental health, livelihoods and the educational prospects of children (Shiban and Molyneux 2021; Stanford Law School and NYU School of Law 2012). The literature illustrates the sense of fear felt by people across all age groups, but particularly children, by the mere presence of a drone overhead or its buzzing sound. One woman and mother in Yemen, said: "When they [the children] hear the drones, they run home from school calling for their mothers, then everyone gets into their cars and evacuate the village" (Shiban and Molyneux 2021, n. p.). (Mothers described how children experienced significant mental health problems, including insomnia, depression, mood swings, anxiety, apathy, and fear.) The fear of drones also disrupted children's education; whilst some children refused to leave their homes, others were not permitted to by the parents. Similarly, the seemingly random targeting of drones drove some local farmers to stop working on their land out of fear of being killed. For families often living in poverty, this loss of income, or the destruction of a house, vehicle or livestock, or paying for the medical treatment of an injured relative, is a cost they cannot afford.

As conflict is increasingly fought in urban areas, the risk to civilians and essential infrastructure increases. The destruction of essential infrastructure, whether intentional – a violation of international humanitarian law – or unintentional, can have significant reverberating effects (Robinson and Nohle 2017). Damage of civilian infrastructure and housing, the Center for Civilians in Conflict report, "causes disruption to health care, electricity, water, nutrition, sanitation, economic activity, and other essential services" (Orr 2021). Indeed, "most civilian casualties in war [. . .] are due to the destruction of the essentials of daily living" (Wise 2017, 139). In recent conflicts, we have seen airstrikes damage power plants (Human Rights Watch 2014), which can cut off electricity to civilians, and the destruction of water stations (OSCE 2015; Orr 2021), preventing local populations from accessing clean water. This, in turn, could contribute to a cholera epidemic, as seen in Yemen (Allana 2017), for example. Similarly, damages to hospitals can limit access to life-saving care for large populations (Orr 2021; MSF 2019).

It is essential that the whole spectrum of harm caused to civilians during conflict is understood. This will enable states like the UK and US to better prevent and mitigate harm and protect civilians. States should view civilian protection as a strategic, topline, military objective. By minimizing civilian harm and reverberating effects, effectively investigating allegations of harm, and implementing policies that actively protect civilians, states are more likely to be successful. From Iraq and Syria, to Afghanistan and Yemen, a central aim of US and UK interventions have been to win over, or keep on side, local populations. In this environment, civilian protection has to be a topline strategic aim. The failure to prevent and mitigate harm, investigate and ac-

knowledge considerable civilian casualty numbers has had the opposite effect. One important step in rectifying current shortcomings, is by strengthening scrutiny and oversight.

3.5 Deficits in Scrutiny, Oversight, and Accountability

Existing democratic oversight, scrutiny, and accountability mechanisms have largely not kept up with the evolution of states' security and defense activities. In the US and UK, these were designed for large-scale, boots-on-the-ground interventions. The significant cost – financial and human – and backlash following the invasions of Afghanistan (2001) and Iraq (2003) led states like the US and UK to rely increasingly on remote methods of force.

The large-scale military interventions of the early 21st century required legislative support – from the US Congress and UK Parliament. These interventions were subject to public and legislative scrutiny. Important information about the wars were shared with the public, and more sensitive information with legislative committees. This was possible because oversight and scrutiny mechanisms were designed to check conventional, large-scale military operations.

As states like the UK and US increasingly rely on non-conventional force (McKay 2021), the mechanisms available to their respective legislatures to scrutinize military activities are not fit for purpose (APPG on Drones 2019). Drones have been deployed outside of declared conflicts and in the name of counterterrorism, national security, and supporting partners. The executive branch of government, whether it is the White House or Downing Street, have cited this as their justification for not facilitating the same degree of democratic scrutiny and oversight over the use of drones.

On both sides of the Atlantic, this view has been met with some criticism and concern (MacAskill 2018; Representatives Lieu, Omar and Jacobs 2021; O'Brien 2021). In the US, in particular, Congresspeople have voiced considerable concern over covert action, special forces operations, and partner assistance (Mahanty and Shiel 2020). Compared to their colleagues in the UK Parliament, Members of the US Congress have concrete powers that enable some level of scrutiny over aspects of US remote force; Congress controls the military purse-strings, and committees can conduct inquiries and subpoena witnesses (Walpole and Karlshoej-Pedersen 2018). Indeed, Congress has taken a more proactive role in scrutinizing military activities and improving civilian protection (Walpole and Karlshoej-Pedersen 2018). Despite this, media reports and civil society documentations have shown persistent issues with poor intelligence and misidentification causing civilian harm, and flawed or blocked investigations (e.g., New York Times n.d.).

In the UK, a growing number of legislators and legislative committees have raised concerns about UK military engagements – in particular remote methods of force, such as airstrikes by drone and conventional aircraft and special forces activities –

outpacing methods of legislative scrutiny (Walpole and Karlshoej-Pedersen 2018). Unlike their US counterparts, UK parliamentary committees must get governmental approval to conduct an inquiry. Members of Parliament are largely restricted to asking parliamentary questions or raising concerns in debates.

As the deployment of military force evolves, it is crucial that mechanisms for democratic scrutiny and oversight develop alongside them (APPG on Drones 2019). Despite aerial power, in particular drone strikes, being touted as ever more precise and humane by the governments that deploy them, frequent civilian casualties, including from poor intelligence and flawed targeting, underlines the importance of improved democratic scrutiny and oversight. The failure to protect civilians adequately has repeatedly undermined UK and US military objectives, and can have further reputational costs.

Congress and Parliament can play an important role in improving the US and UK's civilian protection policies and practice. Media and civil society investigations have revealed widespread, systemic flaws in the policies pertaining to investigate, prevent, mitigate, and remedy harm. The US is further along this path. Yet both states are in need of an improved understanding of the harm they cause and how to prevent it.

3.6 Mitigating, Preventing, and Remedying Harm

Investigations, inquiries, and reports into the large-scale, boots-on-the-ground wars in Afghanistan and Iraq have highlighted significant gaps in the US and UK's ability to adequately understand, prevent, mitigate, and remedy civilian harm caused, even with personnel deployed on the ground. As both nations increasingly rely on drones and other forms of remote force, these challenges have exacerbated.

When deploying drones the UK and US have minimal to no personnel on the ground. This limits the means by which they can investigate, record, and understand the direct – not to mention reverberating – harm caused. This is aggravated by flawed intelligence and targeting procedures, as well as inadequate post-strike data collection and investigative processes.

To bridge the gap left by states, civilian casualty investigations and recording has largely been conducted by independent monitoring groups and the media. Working on shoestring budgets, non-profit organizations have provided credible assessments of civilian harm incidents based on open-source information. Likewise, local journalists and activists on the ground have documented and reported on evidence of civilian harm. In the US, civil society and media reporting has revealed significant flaws in intelligence and targeting processes, and patterns of failure in civilian harm investigations and recording (e.g., New York Times n.d.). This has driven the US to take steps towards improving its policies, guidance, and operations. The UK, on the other hand, continues to insist that it does not have a problem. This, despite investigations by the

US military and independent monitoring organizations finding that the UK has killed civilians (Fisher 2020; Oakford 2018).

Over the past decades, civil society, journalists, experts, and others have worked tirelessly to improve the protection of civilians in armed conflict. Indeed, experts at the forefront of the field have developed policies, military guidance, and operational practices that would bridge states' existing gaps and equip them to better understand and mitigate harm. Whilst this chapter does not have the space to do these recommendations justice, it is instructive to briefly outline some of the most important ones, to illustrate the work already done in this field, and how, if applied by the UK and US, it could significantly improve civilian protection.

In today's conflicts, civilian harm and military success are interlinked; significant civilian harm can seriously undermine any military operation. As such, it is essential that mitigating and responding to civilian harm and humanitarian needs is an explicit and topline objective in all operations, guidance and training (Human Rights Watch et al. 2022; APPG on Drones 2018).[8] Herein, it is essential that states understand the full breadth of civilian harm, including reverberating civilian harm (Human Rights Watch et al. 2022; Orr 2021; Robinson and Nohle 2017). The destruction of essential infrastructure, for example, can cause widespread and long-term harm.

States should immediately take steps to address well-documented issues that repeatedly cause civilian harm, for example misidentification or confirmation bias. It is essential that states take steps to understand the causes of civilian harm and how to address harm caused by their own operations and partnerships, including processes by which partnerships can be modified in the face of high civilian harm (Human Rights Watch et al. 2022).

This must be accompanied by civilian harm investigations and assessments that are comprehensive and transparent – incorporating external information, from, and closing feedback loops with, civil society, survivors, and witnesses. This should include a plan for reviewing and responding to past cases of civilian harm (Human Rights Watch et al. 2022).

4 Conclusion

The aim of this chapter has been to shine a light on the civilian harm caused by drone strikes and human experience of drone warfare. Despite a rapidly growing body of literature focused on drone warfare, this perspective is rarely covered. The chapter

8 The recommendation herein draws on the work of numerous civil society organizations, including Amnesty International, Center for Civilians in Conflict, Airwars, Care, Human Rights Watch, Humanity and Inclusion, InterAction, Norwegian Refugee Council, Oxfam, and PAX (see Human Rights Watch et al. 2022).

has shown how states' use of armed drones has contributed to the erosion of civilian status through the reinterpretation of long-held understandings of fragile regimes of rights, whilst leveraging the cracks that exist within them. This has enabled states to sidestep acknowledgment, recognition, and accountability for civilian harm across conflict zones, leaving civilians unprotected and without recourse to justice and remedy. The real-life consequences of this practice are devastating, seeing a steep rise in civilian casualties in sharp contrast to widespread underreporting by states. Importantly, we urgently need to have a better understanding of civilian harm caused by drones, taking into account the broader, reverberating harm that will impact generations to come. Important work conducted by civil society, activists and experts to identify and improve civilian protection continues to push states to do better to uphold their obligations to civilians, and this chapter contributes three recommendations that, if applied by the US and UK governments, would immediately improve protection.

Seminar Questions

1. Why has the human experience of drone warfare been neglected in academia and policy circles?
2. How has the use of drone technology impacted the status of the civilian in warfare?
3. How has the use of drone technology impacted domestic UK and US and international oversight and scrutiny regimes?
4. NGOs and civil society have been able to conduct accurate assessments of civilian harm on shoestring budgets; why have states not done the same with access to significant resources and technology?
5. What are the barriers to identifying, monitoring, preventing, and remedying civilian harm?

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13 Drone Warfare and Public Opinion

Abstract: What are the implications of public opinion for countries' use of drones? While scholars have studied this question there is a lack of consensus on the outcomes of public attitudes for countries' drone policies. I argue that several factors shape the inconclusive findings. First, scholars often conflate public opinion with US attitudes, therefore discounting other audiences. Second, scholars adopt different explanations for the influence of public opinion on policy formation, with some emphasizing the "bottom-up" pressures of citizens and others pointing to the "top-down" manipulation of elected officials. Finally, few scholars tap into the beliefs and values that underlie public attitudes to understand how these microfoundations may shape opinions in the context of drones. These three axes – audience, influence, and microfoundations – frame two generations of scholarship that help explain conflicting findings for the implications of public opinion on countries' use of drones. In light of this observation, I propose a new research agenda to better understand the relationship between public opinion and the globalization of drone use.

Keywords: Drones, legitimacy, public opinion, survey experiments, United States

1 Introduction

What are the implications of public opinion for political officials' use of force abroad? Writing in 1922, Lippmann defined public opinion as "pictures" people have in their heads regarding current events that they act upon when attempting to shape political decision-making for the use of force abroad. Recent research conducted by Kertzer and Zeitzoff reinforces Lippmann's finding, suggesting that "*individuals do carry meaningful orientations toward foreign affairs around in their heads with them*," which they draw on when engaging political officials on important policy decisions like military interventions abroad (2017, 554, italics original). In the context of countries' use of force generally, scholars often adopt two positions when adjudicating how public attitudes may shape political decision-making. Some contend that public opinion can shape foreign policies by encouraging political officials to make decisions for the use of force abroad that align with citizens' expectations (Page and Shapiro 1992). Others argue that elite preferences do more to shape political officials' decisions to use force abroad (Zaller 1992).

The emergence of armed and networked drones following the terrorist attacks of 9/11 has exacerbated these countervailing explanations (Rowling and Blauwkamp

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2021; Ceccoli and Bing 2018; Kreps 2014).[1] This is because drones have special qualities that differentiate them from other capabilities that also afford militaries standoff on the battlefield, such as bombers and jets. Armed and networked drones epitomized by the General Atomics MQ-9 Reaper provide elected officials a cost-effective way to pursue especially strategic objectives, such as “decapitating” terrorist organizations, while mitigating risk to their own soldiers and preventing unintended consequences, namely civilian casualties (Lushenko, Bose, and Maley 2022; Regan 2022a; Kreps 2016). Drones, at least when used by democracies, also circumvent congressional oversight and public accountability, which are the key mechanisms that enable public opinion to influence political officials’ use of force in the first place. Thus, while scholars have explored the relationship between public opinion and political officials’ use of drones, their findings are often inconsistent.

In this chapter, I argue that the inconclusive findings reflect several factors that have shaped the research agenda on public opinion and drone warfare. First, scholars study the attitudes of different audiences. Though earlier studies polled US citizens’ attitudes for drones to proxy for global public opinion, there is increasing recognition that this practice can bias the results, threatening to undermine their generalizability. Second, scholars adopt conflicting assumptions for how public opinion may influence political decision-making. The scholarship for public opinion and drone warfare is shaped by contrasting beliefs in the “bottom-up” rationality of citizens and the “top-down” impact that elected leaders have on the use of force abroad (Payne 2020; Kaag and Kreps 2014; Saunders 2011; Western 2005). Few scholars attempt to reconcile these perspectives and those that do have not studied the implications for drone warfare (Kertzer 2020; Kertzer and Zeitzoff 2017). Finally, though there is broad recognition that beliefs and values underlie public attitudes, some scholars attempt to tap into these “microfoundations” while others do not (Kertzer 2017). These three axes – audience, influence, and microfoundations – frame two generations of scholarship that help explain competing findings for public opinion and drone warfare. Understanding these phases of scholarship is important because they reflect assumptions that inform scholars’ thinking about why and how public opinion may shape countries’ drone policies.

In the remainder of this chapter, I first define these two generations of scholarship. Next, I suggest an approach to better understand the relationship between public opinion and the evolving globalization of drone warfare, which Rogers (2022a) refers to as the “third drone age.” This new research agenda adopts moral legitimacy – perceptions of rightful conduct – as the locus of public attitudes; emphasizes variation in civilian casualties following strikes as an important factor shaping public attitudes toward drones; and, encourages a focus on the attitudes of citizens from the targeted

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1 A minority of scholars also conclude that public opinion has no impact on foreign policy formation. This line of argument, however, is relatively underdeveloped. See Jacobs and Page (2005).

country as a barometer for public opinion. I conclude by introducing two questions that are informed by the third drone age and should continue to shape scholars' analysis of the relationship between public opinion and drones. First, how do shifting patterns of drone warfare globally shape public opinion? Second, what are the implications of drone warfare for the perceived legitimacy of global order?

2 Two Generations of Scholarship

Following 9/11, after which the US adopted drones as a key pillar of its counterterrorism policy, public opinion research in terms of drones has reflected several methodological consistencies. First, scholars use survey experiments to test how variation in certain conditions, such as the targeting country or international approval, shape public attitudes for drones. Surveys are appealing because they constitute randomized controlled trials that help minimize biases associated with other research designs, such as studies that use observational data (Blankshain and Stigler 2020; King, Keohane, and Verba 1994). Second, scholars gauge public opinion in terms of approval and support. This decision is based on the assumption that these attitudes define how citizens engage political officials' deciding to use drones. Scholars discount other attitudes, such as legitimacy and fear, that could be equally, if not more explanatory of the public's preferences (Lushenko, Raman, and Kreps 2022).

Finally, scholars typically define their survey scenarios in terms of US counterterrorism strikes. To the extent the targeted country is fictional, the location of strikes is often defined in terms of a foreign country that is plagued by instability and insecurity. These decisions impose at least two tradeoffs for the treatment effects, or how well the results approximate what people actually believe. On the one hand, Rowling and Blauwkamp show how "survey questions that consistently favor some considerations over others can inadvertently lead officials to act based on misleading or incomplete indicators of public sentiment" (2021, 3). On the other hand, US officials' use of drones to kill terrorists no longer constitutes the typical pattern of drone warfare globally, suggesting that using Americans' attitudes for strikes to proxy for global public opinion is misleading (Lushenko and Kreps 2022). This is especially problematic in a European context. As we will see, European countries attempt to balance their relationship with America against clear policy differences over drones resulting in uneven capability development (Cvijic et al. 2019). It is unclear, then, what existing studies for US attitudes toward drones mean for the beliefs and values that may underlie European preferences, as well as public opinion in other regions.

In sum, the existing scholarship reflects broad methodological continuity. Despite or because of such consistency, scholars have also adopted different audiences, emphasized different levers of influence, and generally discounted the microfoundations of public attitudes (see Table 13.1). Shifts in these three axes frame two generations of

scholarship that I contend help explain competing findings for public opinion and drone warfare since 9/11. Reflecting on these phases of scholarship is important to decipher the possible implications of public opinion for countries' drone policies.

Table 13.1: Two generations of public opinion and drone warfare scholarship.

Generation	Audience	Influence	Beliefs & Values	Key References
First	Americans	Bottom-Up	No	– Kreps (2014) – Kreps and Wallace (2016) – Horowitz (2016) – Schneider and Macdonald (2016) – Boddery and Klein (2021)
Second	Cross-national	Bottom-Up, Top-Down	Yes	– Ceccoli and Bing (2018) – Fisk, Merolla, and Ramos (2019) – Rowling and Blauwkamp (2021) – Lushenko (2022a) – Lushenko, Raman, and Kreps (2022) – Lushenko and Kreps (2022) – Kreps, Kriner, and Lushenko (2022) – Lin-Greenberg (2022)

2.1 First Generation

The first generation of scholarship is framed by a focus on US citizens, a bottom-up interpretation of public opinion, and inattention to the beliefs and values that may underline Americans' attitudes (see Table 13.1). First, scholars usually draw on US citizens to tap into public opinion for drones. To be fair, this practice is understandable. Notwithstanding the proliferation of drones globally, the US is still the most prolific user of strikes beyond its immediate borders and region. This suggests that Americans may serve as a useful litmus test for global public opinion, which is also a key assumption in the arms trade literature (Erickson 2018). The United States, for better or worse, also benchmarks democratic political regimes globally. The potential constraint afforded by public opinion on US officials' use of strikes is thought to serve as an example for other democracies (Reeves and Rogowski 2016; Watts 2008).

More importantly, the data for US strikes is better curated than it is for other countries' uses of drones (Carter 2022). Indeed, the Bureau of Investigative Journalism and other watchdog groups are designed to aggregate data for US strikes. They attempt to account for America's "quasi-secretive" use of drones (Banka and Quinn 2018), which has resulted in more civilian casualties than US officials admit (Regan 2022a; Raman, Lushenko, and Kreps 2021). Aside from Drone Wars UK and the Yemen

Data Project, few databases exist to account for other countries' adoption of drones. While pairing US-centric databases with Americans' feedback may provide for interesting findings, this imposes a tradeoff for the generalizability of the results. Ceccoli and Bing find "tepid (or at least mixed) support among European citizens presents a stark empirical contrast with such uniformly strong support in the United States" for drone strikes (2018, 248). This suggests that the existing literature also does not account for distinct models of strikes adopted by other countries that may moderate public attitudes in unique ways, which I discuss below.

Second, scholars share an assumption that public opinion can shape political officials' preferences for drone strikes without showing that it actually does. Kreps (2014) finds that while Americans generally support strikes abroad, their perceived compatibility with international law can moderate the magnitude of effect. This is consistent with a study by Schneider and Macdonald (2016), who find that Americans support strikes when they are perceived to comply with domestic and international law. Kreps and Wallace (2016) further find that international and non-government organizations, such as the United Nations (UN), can shape public attitudes for strikes, especially when criticisms relate to the legality versus effectiveness of operations. Horowitz (2016) also finds that public attitudes for strikes are contextual, shifting based on the degree to which they protect soldiers. Ron, Lavine, and Golden (2019) show that this support can be offset when strikes kill civilians, however. Similarly, Boddery and Klein (2021) find a successful strike can increase presidential approval despite a staggering economy, which corroborates the diversionary use of force for domestic political gain. While these studies are useful to benchmark how scholars think about at least US attitudes toward strikes, they share a common theme. None addresses how or to what extent the public can actually influence political officials' use of strikes.

Further, the tendency for scholars to privilege a bottom-up explanation for public opinion and drone warfare is surprising because experts also caution that drones allow political officials to evade public accountability for the use of force abroad that helps explain their unique appeal (Goldsmith and Waxman 2016). Indeed, drones threaten a moral hazard while also eroding public oversight, which is a hallmark of democracy. During his administration, US President Barack Obama admitted officials "were getting too comfortable with the technology as a tool to fight terrorism, and not being mindful enough about how that technology is being used and the dangers as a form of warfare that is so detached from what is actually happening on the ground" (Friedersdorf 2016). Lupton (2020) also finds that drones may create more problems than they solve because they do not resolve grievances that engender political violence. This finding is consistent with Regan's (2022a) analysis of the strategic effectiveness of US drone strikes since 2002, which he finds have been inconsequential in defeating terrorist groups.

Finally, because researchers often assume that the bottom-up pressures of public opinion can shape US policy for counterterrorism strikes, most have not explored the beliefs and values that may underlie citizens' preferences for drones. This oversight

could reflect a shared belief among scholars that public attitudes are uniquely structured in terms of strikes (Hurwitz and Peffley 1987). Ceccoli and Bing argue that "ideology and core policy beliefs shape respondent sentiment toward drone strikes in clear and convincing ways" (2018, 249). Yet, scholars neither theorize about nor test the mechanisms that may shape public attitudes for strikes, whether they relate to "cold" (cognitive) or "hot" (affective) processes (Kertzer and Tingley 2018; Kertzer and Zeitzoff 2017).

In one instance, Kreps and Wallace (2016) use a survey experiment of American respondents finding that public opinion for strikes seems to relate more to normative (e.g., moral) rather than strictly instrumental (e.g., reputation) concerns. While this is echoed by a recent study for the United States' use of force more generally (Dill and Schubiger 2021), Kreps and Wallace caution that their findings deserve more study to specify the mechanisms that explain this observation, which others have also encouraged. Fang and Oestman (2022), for instance, recently commended scholars to "unpack" the mechanisms that may shape public opinion for drones as a way to better explain the anticipated benefits and costs of conducting strikes in different strategic contexts. Doing so requires the use of an innovative statistical method know as causal mediation analysis that researchers working within the second generation of scholarship adopt and I address below.

2.2 Second Generation

The second generation of scholarship builds on earlier studies by adjudicating public opinion cross-nationally, reconciling bottom-up and top-down explanations for the influence of public opinion, and identifying microfoundations that may shape public attitudes. First, the proliferation of drones, including both military-grade and commercial variants, has encouraged scholars to acknowledge the pitfalls of essentializing public attitudes for strikes to US beliefs. Whereas a majority of Americans expressed support for drone strikes in every national survey from 2011 to 2018 (Davis 2019), the results are more mixed across Europe, even among members of the initial "drone club" including France, Germany, Italy, the Netherlands, Poland, and Spain, as well as recent arrivals such as Poland (Adamowski 2022).

Using data from the 2013 Transatlantic Trends Survey, Ceccoli and Bing (2018) show that the reasons for inconsistent beliefs among the publics of Europe's drone club countries are complicated. They also find, however, that a preference for strong transatlantic security ties with the US significantly shapes citizens' approval for drone strikes across all drone club countries. Given its frequent use of drones in Western Africa, Lushenko, Raman, and Kreps (2022) also interpret France as a useful gauge for non-US perspectives on strikes. Besides the United States, France is the only great power that uses drones beyond its borders and region. The authors field a survey experiment across representative samples in France and the US resulting in several cross-nationally con-

sistent findings. They show that international approval is associated with both higher public support and greater perceived legitimacy for a strike. They also find that respondents emphasize international law as the basis for support and legitimacy, suggesting a shared belief in multilateralism for normative rather than instrumental reasons. In another cross-national survey experiment, again conducted in France and the United States, Lushenko and Kreps (2022) explore how varying a country's use and constraint of drones shapes the public's perceptions of legitimacy. They find that emerging patterns of drone warfare shape legitimacy outcomes in unique ways, which may or may not reflect elected officials' intent to shape public opinion. American and French respondents prefer distinct models of strikes, and this effect reflects beliefs and values that underlie perceptions of legitimacy. These and related studies help justify broader engagement with non-US audiences to gain leverage over differences in public opinion.

Second, scholars attempt to reconcile bottom-up and top-down explanations for the influence of public opinion. They do so by understanding drone warfare as a leader-driven practice, which comports with a broader movement in International Relations Theory to study the implications of leaders on foreign policy decision-making (Hafner-Burton et al. 2017). In the context of US strikes, most scholars equate operations to a bureaucratic process known as the "Interagency." This captures how defense and intelligence agencies, such as the Pentagon and Central Intelligence Agency, coordinate to facilitate strikes abroad (Regan 2022a). Yet, strikes are not authorized and used by countries as such, but leaders. Stein argues that countries "cannot think, process information, estimate probabilities, or calculate, only their leaders can" (2017, S256). This suggests that public opinion may be endogenous to – or a structural feature of – political officials' use of drones. This argument is based on the assumption that political officials, especially US presidents, both constitute and are constituted by public opinion (Saunders 2022; Boddery and Klein 2021; Yarhi-Milo 2018; Sterio 2018; Kaag and Kreps 2014; Saunders 2011; Western 2005; Krasner 1983).

Payne shows that "presidents not only have the power to shape and lead public attitudes, but have increasingly sought to do so" (2020, 167), which studies by Kenwick and Maxey (2022), Horowitz, Stam, and Ellis (2015), Lenz (2012), Edwards (2000), and Moe and Howell (1999) corroborate. Indeed, Western also finds that "Congress, like the public, has tended to defer to the judgment of the executive branch, and popular presidents are given more latitude" to use force abroad including drones (2005, 225). According to Sterio (2018), such latitude makes presidents "judge, jury, and executioner." Representative Steve Israel (D-NY), who served on both the Armed Services Committee and Appropriations Subcommittee for Defense, corroborates this trend. He recalls that Congress "did not effectuate sufficient oversight related to the drone program" during his tenure, which spanned two decades following 9/11 (2022). In their study, Rowling and Blauwkamp (2021) also find that the perceived legality of strikes among US citizens during the Trump administration was mediated by attitudes toward the president. Trump supporters were more likely to deem his use of strikes as legal than were those who opposed the president, which reinforces findings by Kreps, Kriner, and Lushenko

(2022) and Kriner (2018). In my own analysis, I also show how presidents' worldviews inform their understanding of drones and shape their decisions to use strikes (Lushenko 2022a). These worldviews are embedded with and reflective of public opinion, including perceptions of legitimacy. The existing scholarship, then, implies the need for more empirical research to decipher the balance between countervailing explanations for the influence of public opinion on political officials' decisions to use drones (Walgrave et al. 2022).

Finally, some scholars adopt causal mediation analysis to determine how beliefs and values may shape public approval and support for drones. This method shows the complete causal chain for the effect of an independent variable on a mediator and the effect of a mediator on the dependent variable (Imai et al. 2011). Put differently, it shows "the mechanism by which an exposure (treatment) affects an outcome, in particular by studying intermediate variables that might be responsible for transmitting such an effect" (Miles 2022, 2). Causal mediation analysis is sometimes criticized for failing to account for omitted variables, even in an experimental setting such as a survey that researchers usually champion for resolving bias (Simonsohn 2022). Under certain assumptions, however, causal mediation analysis allows researchers to better explore beliefs and values that may be responsible for shaping public attitudes toward drones (Chaudoin, Gaines, and Livny 2021; Imai, Keele, and Tingley 2010).

Fisk, Merolla, and Ramos (2019) study the implications of "hot" mechanisms, namely the emotions of anger and fear, for the public's support for strikes in a cross-national – France, Turkey, and United States – context. Their findings are mixed. They report statistically significant evidence for the mediating effect of anger on public support for drones across all three countries but a null effect for fear. Lin-Greenberg (2022) also shows how "emotional" and "instrumental" drives, such as fear or reputation for resolve, can shape US miliary officials' use of drones in the context of conflict escalation. Building on these studies, Lushenko and Kreps (2022) test several "cold" or cognitive mechanisms among American and French respondents. While Americans mostly emphasize international law while assessing the legitimacy of a strike, French citizens' perceptions of legitimacy are explained by several beliefs. These include preferences for the use of force abroad, morality of a strike in terms of little collateral damage, and the perceived merit of an operation based on UN approval. It is impossible to know whether these beliefs, as opposed to others, actually shape American and French attitudes toward drones all the time. Nonetheless, causal mediation analysis provides a more comprehensive understanding of why publics may perceive some countries' use of drones to be more legitimate than others.

3 Toward a Third Generation of Scholarship

Together, these two generations of scholarship have broadened our understanding of public opinion and drone warfare, giving us additional insight into how the public may form its preferences and exercise influence over political officials' decisions to use strikes. Scholars have also capitalized on the insights of early research to advance the literature in new, interesting, and useful ways. Writing within the second generation, Rowling and Blauwkamp (2021) specify that their study builds on previous research, most notably Kreps's (2014) survey experiment that helped define the first generation. Similarly, scholars writing within the second generation have also capitalized on new insights and methods to reevaluate observations made by their predecessors. Building on Kreps (2014) and Kreps and Wallace (2016), Lushenko, Raman, and Kreps (2022) use a cross-national survey experiment to find that while both American and French citizens emphasize international law when adjudicating support and legitimacy for strikes, the outcome is strongest for US subjects. Americans also emphasize burden-sharing in the case of internationally approved strikes conducted by another country, suggesting a preference for coalition operations to offset the costs of conducting strikes. This finding is consistent with Americans' support for multilaterally authorized interventions conducted by US allies.

The combined momentum of the first and second generations of scholarship suggests promising avenues for future research. These relate to (1) exploring public attitudes for strikes beyond approval and support, namely perceptions of legitimacy; (2) further varying the civilian casualty outcome in survey vignettes to better measure the implications for respondents' attitudes; and, (3) shifting the focus from the attitudes of citizens within targeting countries to the attitudes of citizens within targeted countries. I briefly address each of these opportunities before concluding with two additional questions that may also help inform future research for public opinion and drone warfare, and reflect movement toward a third drone age.

3.1 Legitimacy

We know "surprisingly little" (Ceccoli and Bing 2018, 247) about how people form judgments for legitimate drone strikes, however, despite claims that legitimacy is "central" to countries' adoption of drones (McDonald 2021, 539). Very few – if any – scholars attempt to study this outcome empirically (Regan 2022a; Barela 2015; Dill 2015). Indeed, Lewis and Vavrichek caution there has been an "inadequate consideration of *legitimacy*" in drone policy and scholarship (2016, 172, italics original). This is more surprising still because especially American officials often characterize US strikes as "legitimate" or "righteous," even when they inadvertently kill civilians. This was the case for the Biden administration's botched strike in Kabul, Afghanistan on August 29, 2021. Instead of killing an Islamic State terrorist preparing to strike US

forces with a vehicle packed with explosives, the strike killed ten civilians (Aikins et al. 2021). Political officials use the language of legitimacy based on the belief that the public does not challenge actions it deems rightful, which preserves decision-making autonomy for the use of force abroad (Goddard and Krebs 2015; Voeten 2005).

If legitimacy, defined broadly as the subjective beliefs people have in the appropriateness of wartime conduct (Hurrell 2004; Suchman 1995), is so integral to the sustainability of drone strikes in both domestic and international contexts, then scholars should study perceptions of legitimacy as a dependent variable in survey research. Of course, there are methodological challenges in doing so (Tallberg and Zurn 2019). Legitimacy is a social phenomenon meaning it can be difficult to identify, measure, and test, especially in cross-national contexts (Hodges 2018). The biggest contribution of my ongoing research, then, is to study the public's perceptions of legitimacy with empirical data while using statistical methods. I identify and empirically evaluate the mechanisms that may shape the public's perceptions of legitimacy in both a US and cross-national context. The initial results are promising. I find that the public's perceptions of legitimate strikes are a function of why and how drones are used, and that perceptions of legitimacy can be moderated by the country conducting strikes, international approval through the UN, and the unintended consequences, mainly civilian casualties (Lushenko 2022b; Lushenko, Raman, and Kreps 2022; Lushenko and Kreps 2022; Lushenko 2021).

3.2 Civilian Casualties

These findings suggest the need for more research to determine how civilian casualties can shape public opinion for drone warfare. To the extent the existing research incorporates civilian casualties into survey vignettes, the collateral damage estimate is low, usually no more than a handful of civilian deaths. There is good reason for this choice of treatment. Controlling for a few outliers, the available data suggests that at least the average US counterterrorism strike results in less than two civilian casualties. There are at least two tradeoffs in keeping the civilian casualty treatment low, however. First, these low per strike figures reflect considerable harm when aggregated over time, amounting to thousands of civilian deaths.[2] Second, scholars lack understanding of what is called the "risk ratio." This is defined as citizens' belief in the "acceptable" number of civilians to soldiers killed during a combat operation. While we have a good understanding that at least Americans' risk ratio for conventional – country-on-country – war lies somewhere between 4:1 and 40:1, we cannot be sure for drone warfare (Sagan and Valentino 2020; Tirman 2011). The findings are important to clarify intuitions about the moderating effect of civilian casualties for the public's

2 I thank Amelia Arsenault for this helpful observation.

perceptions of legitimacy. While Regan posits "avoiding civilian harm may be important to the perceived legitimacy of strikes," this is an empirical question he cautions deserves more study (2022a, 314). Regan notes that it "could be that when force protection is not regarded as a relevant consideration, people believe that there is a greater responsibility to avoid civilian casualties" (2022b).

There is an added benefit of varying civilian casualties as an independent variable in survey research. This not only helps us adjudicate a belief that minimizing civilian casualties is a "precondition for the perceived legitimacy of [. . .] strikes" (Regan 2022a, 317). It also helps reconceptualize the effectiveness of countries' use of drones. Presently, scholars – as well as many policy-makers, military practitioners, and casual observers – perceive the effectiveness of strikes in terms of the number of dead terrorists, especially high-value targets such as charismatic leaders (Hardy and Lushenko 2012), as well as a reduction in terrorist attacks (Regan 2022a; Schwartz, Fuhrmann, and Horowitz 2022). Less attention is paid to the protection of civilians, which is a strategic, moral, and legal imperative imposed by international law (Fazal 2018). This oversight has caused Muhammedally and Mahanty to emphasize that "the protection of civilians should be integrated into [military] planning, intelligence, operations, targeting, and training" (2022, 8).[3]

While my initial research shows that civilian casualties can shape public perceptions of legitimacy, we need to know more, which will help justify civilian protection as a measure of effectiveness for strikes. In one recent survey experiment, we find that Americans' preferred model of drone warfare is conditioned by a civilian casualty. Americans' perceptions of legitimacy are consistent when a strike is used with unilateral (internally-imposed) or multilateral (externally-imposed) constraint and does not kill a civilian. When a strike does kill a civilian, however, Americans' perceptions of legitimacy are shaped by multilateralism. We find that French respondents do not differentiate between constraints similarly. Their perceptions of legitimacy are strongest when a strike is used with multilateral constraint, regardless of a civilian casualty. These results imply that while Americans and French respondents may prefer unique models of strikes, Americans also prefer the cover of multilateralism when strikes result in civilian casualties (Lushenko and Kreps 2022).

3.3 Targeted Countries

Finally, there is an outstanding question for if, and to what degree, civilian casualties can result in international condemnation and blowback, especially in terms of height-

3 This observation is also echoed in a report on the Battle of Raqqa in October 2017, when the US military engaged the Islamic State resulting in high numbers of civilian casualties. See McNerney et al. (2022).

ened violence and recruitment for terrorists. While many scholars believe this is the case (Cronin 2013), the available evidence is dubious because scholars have not explored the attitudes of citizens within countries targeted by drones. Silverman (2019) notes that understanding the attitudes of citizens in countries where strikes occur is important for at least two reasons. First, civilians can shape the information environment through protests that spill over into social media and reshape the strategic context of conflict. Second, citizens' beliefs about a conflict can shape their support to one side or the other, as well as how aid is channeled. It is puzzling, then, that scholars have not broadened the scope of their analysis to include the attitudes of publics who are on the receiving end of strikes.

In addition to Pong (2022), Silverman is one of a few researchers who have recognized that the existing scholarship fails to account for the beliefs of citizens within countries targeted by drone strikes. He uses a survey experiment administered among 1,000 Pakistan citizens to determine how variation in the targeting country (Pakistan or United States) and consequence (civilian casualties or not) shape their beliefs about a strike. He finds that the identity of the intervening country strongly shapes Pakistan citizens' perceptions of a fictional strike's discrimination between combatants and noncombatants. He cautions this finding is conditioned by Pakistan citizens' religiosity. The more devout a Pakistan citizen is the more he or she believes a strike is inherently indiscriminate, imposing a higher liability to be harmed on innocent civilians. This set of findings is important because it helps explain why a preponderance of Pakistan citizens have not supported US strikes (Fair and Hamza 2016).

Though these results are also intuitive, Silverman's study is important for additional reasons. It is systematically executed, meaning the results are falsifiable and replicable, allowing researchers to probe the data for additional findings. To the extent other scholars assess attitudes of the intervened, they conduct field research that, while useful, is potentially biased. Their respondent pools consist of citizens affected by drones, meaning it is difficult if not impossible to determine what actually accounts for citizens' beliefs (Cachelin 2022; Ansari 2022; Page and Williams 2021; Dill 2019). Is it citizens' *ex ante* beliefs about drones that shape their attitudes? Or, it is citizens' exposure to harm during a strike, regardless of the intentionality, that shapes their beliefs *ex post*? Given these challenges, the task for researchers who study public opinion and drone warfare is clear: use survey experiments that extend the second generation's cross-national audience to include citizens within countries targeted by strikes. While the results will further complicate our understanding of public opinion and drone warfare, they will also be useful to justify two additional questions that should help inform future research.

4 The Globalization of Drone Warfare and Public Opinion

In closing, I reflect on Rogers's understanding of a third drone age to introduce two questions that are designed to determine how the globalization of drone warfare may further shape public opinion. First, to what degree do emerging patterns of drone warfare moderate the public's perceptions of legitimate strikes? Scholars agree that drone warfare is evolving in ways that differ from US counterterrorism strikes. Some journalists speculate that the Turkish-manufactured TB-2 Bayraktar drone, used in conflicts across Africa, Central Asia, Europe, and the Middle East, has irrevocably altered not just the character but nature of war (Calcara et al. 2022; Khan 2022; Pitel and Jalabi 2022; Witt 2022). Other scholars go so far as to identify country-specific models of strikes. Vilmer identifies a "French model" of drone warfare, where French strikes in Mali are "much more harmonious, in terms of respect for humanist values" (2021). Still other scholars conceive of shifting models of strikes in functional terms. Rogers observes the development of "saturation strikes" characterized by "multi-drone deployment mixed with missiles and rockets that are sent all at once toward targets such as US bases, US diplomatic sites, and the capital cities of Western allies, such as Abu Dhabi, to take out sensitive targets." Rogers also assesses that "nations are using their drones internally in an armed capacity" to "suppress civil wars" (2022b).

These observations are helpful to demarcate what Rogers refers to as the third drone age. According to Rogers, "non-state groups will continue to capitalize on the vulnerabilities of more powerful state militaries, just in a more conventional way by adopting the latest technologies to help improve the effectiveness of their locally produced, augmented or state-supplied weapons," including drones (2022a). The next step in the research agenda for public opinion and drone warfare, then, is to determine what these shifting patterns of drone warfare mean for citizens' attitudes, considering they could have important implications on the sustainability of countries' drone policies. This investigation is predicated on scoping the key attributes of evolving patterns of strikes. Fortunately, scholars have presented several useful typologies to focus the research. Gusterson (2015) distinguishes between "mixed" and "pure" strikes, which are differentiated by their support to expeditionary forces. Brunstetter (2021) characterizes strikes in terms of "self-defense" and "cooperation." The latter model consists of strikes in support of internationally approved interventions. The former model relates to unilaterally conducted strikes for targeted killing from a distance. Chapa (2022), for his part, identifies two types of "tactical" and "strategic" strikes that correspond to military commanders' and political officials' authorization, respectively.

In my estimation, evolving patterns of drone warfare globally can be defined by countries' differing use and constraint of strikes. Drones can be used tactically on the battlefield or as part of a strategy designed to achieve broader military and political objectives. Countries can also use strikes with different unilateral – self-imposed – or

multilateral – externally-levied – constraint. These consist of different "reasonable" and "near" certainty standards for no civilian casualties during strikes as well as international approval for strikes through the UN. Variation in the use and constraint of drones suggests four broad patterns of strikes that are emerging (Lushenko 2022b).

First, countries can use drones strategically with unilateral constraint, which I refer to as "over-the-horizon" strikes. This characterizes the use of drones to attack terrorists in faraway lands without deploying boots on the ground – such as America does in Yemen – in what Munro (2015) dubs a form of neo-colonialism. Second, countries can use drones strategically with multilateral constraint. This pattern, which I refer to as "aerial occupation" following Emery and Brunstetter (2015), enshrines the presence of drones above other countries' territory, threatening to undermine their sovereignty. One example is the United States' use of drones in Libya in 2011 to arrest a humanitarian crisis (Matisek 2022). Critics also caution that this second model of strikes can constitute "racialization from above" because the targets tend to be black, indigenous, and people of color (Feldman 2011), though this observation may be biased because most transregional terrorists are not white. Third, countries can use drones tactically with unilateral constraint, implying a "predatory" pattern of strikes that is most prevalent during intrastate conflicts and border disputes, such as that between Armenia and Azerbaijan in the contested Nagorno-Karabakh region. Finally, countries can use drones tactically with multilateral constraint, which I call a "juridical" form of strikes and Vilmer (2021) equates to a French model. Beyond my initial research, it is unclear how these patterns of drone warfare shape public opinion in comparative contexts.

Second, most empirical research conceives of citizens' attitudes for drones in terms of national security. This reflects earlier scholarship that fails to engage the broader, global implications of drones. As a result, my colleagues and I lobby for a new wave of research that is designed to interpret the implications of countries' use of drones for the legitimacy of global order (Lushenko, Bose, and Maley 2022). We define this concept as the pattern of shared norms and institutions that manage the potential for conflict and encourage countries' cooperation for common goals, including security. We posit that global order is a function of four pillars. These include (1) hierarchy that structures international relations; (2) sovereignty or territorial integrity that is the anticipated dividend of global order; (3) international law that is the key institutional form of global order; and, (4) the diffusion of military capabilities that contributes to countries' coercive foreign policies. We hypothesize that contradictions within and across these four pillars can delegitimize global order. We contribute to the literature on drone warfare by building a new theory, which others can empirically test to determine the degree to which drone strikes, as intuited by citizens in both targeting and targeted countries, shape the perceived legitimacy of global order.

Researchers can adopt three approaches to test our hypothesis. They can ask respondents in cross-national settings to rate their perceptions for the legitimacy of global order after reading a randomized vignette that varies how a strike effects a pillar – or

pillars – of global order. Researchers can also conceptualize the pillars of global order as beliefs and values themselves to determine the degree to which respondents attribute shifts in their perceptions for the legitimacy of global order to these underlying factors after reading a randomized vignette for a strike. Alternatively, researchers can investigate the independent effects of varying all of the pillars of global order within a single survey vignette, what is called a conjoint design, to determine the implications for respondents' attitudes for drones (Leeper, Hobolt, and Tilley 2020). Either way, these two questions, one on shifting patterns of drone warfare and the other on the legitimacy of global order, suggest that the research agenda for public opinion and drones will almost certainly evolve beyond the first and second generations of scholarship to give us a better sense of why and how citizens attempt to shape countries' drone policies.

Seminar Questions

1. How do we understand the relationship between public opinion and officials' use of drones?
2. Why is relating global public opinion to US attitudes for drone strikes problematic?
3. What are the "blind spots" in the research agenda for public opinion and drone warfare?
4. How do evolving patterns of drone warfare globally effect public perceptions of legitimacy?
5. In what ways can researchers study the relationship between public opinion and drone warfare?

Suggested Readings

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Talat Farooq

14 Living Under Drones

Abstract: This article seeks to understand the impact of the US drone campaign on the common people of Waziristan, located in Pakistan's erstwhile Federally Administered Tribal Areas (FATA). Drawing primarily on the author's interviews with different segments of the tribal society, civil and military decision-makers, and Pakistani intelligentsia, as well as her surveys involving 400 tribesmen, the chapter specifically focuses on the plight of tribal civilians in North Waziristan, the principal target of US drone strikes.

Keywords: Collateral damage, tribal structures, precision, mental health, *Pashtunwali*

1 Introduction

Between 2004 and 2015 the Central Intelligence Agency (CIA) employed Predator drones to launch an extensive drone campaign in the tribal agencies of North and South Waziristan in Pakistan's Federally Administered Tribal Areas (FATA). Conducting 429 attacks, the campaign was launched to target the Al-Qaeda and Taliban commanders that were hiding in the agencies after fleeing the US invasion of Afghanistan in 2001. Of the two agencies, North Waziristan became the principal target of US drone attacks. Situated in one of the world's most inaccessible areas, North Waziristan's strategic location has served as a buffer zone between Pakistan and Afghanistan. It is one of the poorest regions of Pakistan with a less than 17% literacy rate.

Prior to the merger of FATA with the Khyber-Pakhtunkhwa (KP) Province in 2018, the state of Pakistan maintained a nominal governing authority in keeping with the British-era indirect governance model. The colonial-era body of laws ensured that FATA remained isolated from the rest of the country, with no or very limited access to the political, legal, and economic rights mandated by the Pakistani constitution.

The Mehsud, Wazir, Dawar and other smaller tribes of South and North Waziristan are organized around a segmentary lineage system and have traditionally adhered to a political, social, and judicial system based on *Pashtunwali*, an unwritten code and ideological framework that has over time evolved its own laws, norms, and institutions (Roy 1990) to maintain social cohesion and tribal equilibrium by emphasizing honor, revenge, sanctuary, and hospitality among other values. Seen as pragmatic and rational by the tribes, *Pashtunwali* is not universal and relies primarily on religious tenets and custom (Kakar 2004).

Within the tribal structure in which the tribal elders are expected to act as guardians and patrons, there are three overlapping sources of authority: the tribal chief or *Malik*, representing lineage-based authority vested in the *Jirga* or council of elders;

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the Political Agent, representing the central government; and the religious leader or the *mullah*, who has traditionally remained an outsider as he is not part of the lineage system (Ahmed 2013).

FATA's character underwent a shift beginning in the 1980s. After the Soviet invasion of Afghanistan in 1979, the CIA and Pakistan's Inter-Services Intelligence (ISI), along with the Saudi intelligence network, collaborated to train and equip Muslim fighters from all over the world; Waziristan served as a supply line to reinforce Afghan fighters, while religious students in FATA were mobilized for *Jihad* or holy war. The strategy empowered the clerics, politically and economically, while undermining tribal traditions. "The foreign militants who came to our areas and were welcomed by us as freedom fighters [against the Soviets] gradually began to question our religious and cultural values [. . .] the mullahs were bought by them" (Interviewee 030, 2014).

As the US re-engaged with the region in October 2001 following the 9/11 attacks, Waziristan was used by fleeing Taliban and Al-Qaeda fighters as a sanctuary. Several Wazir clans, argued an interviewee, agreed to host the Al-Qaeda and foreign Uzbek militants under the *Pashtunwali* value of hospitality but also because it was a lucrative prospect (Interviewee W, 2022). Consequently, FATA and especially Waziristan became the target of both Pakistani military counter-insurgency operations and terrorist activities. A tribal interviewee explained that the Taliban and Al-Qaeda fighters "did not adhere to our customary laws and instead imposed their own extremist ideology on society [. . . and] their brutality against the weak, kidnapping and murder, weakened tribal structures" (Interviewee 002, 2014).

To make matters worse, diverse anti-Pakistan militant groups coalesced into Tehreek-i-Taliban (TTP) in South Waziristan (Coll 2008). They shifted to North Waziristan by 2009 to escape the Pakistan military and US drone strikes. Thus, by 2009, the security situation in North Waziristan was already complex and underpinned with a combination of Pakistan military aerial bombardment and artillery shelling and terrorist violence. It was in this volatile environment that the Obama administration escalated drone strikes in North Waziristan.

General Musharraf consented to the first US drone strike in South Waziristan in 2004, providing the CIA the space to shift focus from capturing to killing while launching an undeclared, remotely controlled war (Mazzetti 2013a; Coll 2014). Musharraf (2014) told the author that until 2008, while he was in power, the Bush administration cleared each strike with Pakistani authorities. However, from 2008 onwards, as insurgent movement increased between Pakistan and Afghanistan, the US also resorted to unilateral action. Drone attacks escalated from 2009 onwards, with one every four days (Bergen and Rowland 2015).

As the campaign unfolded between 2008 and 2014, an anti-drone narrative took hold in urban Pakistan, sustained by print and electronic media, politicians, and all manner of civil society actors (Farooq and Lucas 2018). An insider argued that the military under General Pervez Kayani was the key architect of the narrative, using it to offset American demands for Pakistan to "do more" against the Haqqani Network, the

“strategic asset” of the Pakistan military (Interviewee 024, 2014; Farooq, Lucas, and Wolff 2020). Emphasizing real and exaggerated collateral damage, the narrative was manipulated by the army, the politicians, and the TTP militants to further their respective political agendas (Farooq, Lucas, and Wolff 2020).

This chapter seeks to understand how US drone strikes impacted the daily lives of the people of North Waziristan in an already volatile environment. There is no denying the fact that Pakistan’s armed operations and TTP’s brutal control of Waziristan added to the misery of the population. Clearly, armed drones alone were not responsible for the situation on the ground. Keeping this in mind, this chapter specifically seeks to understand the exclusive impact of the US drone campaign on the common men, women, and children of North Waziristan.

The politicization of the drone narrative in Pakistan, the media blackout, and the Pakistani army’s complete control of access to North Waziristan has kept any accurate estimation of civilian casualties, property damage, and emotional trauma unspecified. Therefore, to endorse the reports compiled by different national and international sources, oral history interviews and surveys serve as the best recourse. Accordingly, drawing upon the author’s interviews with tribesmen, military officials, politicians, journalists, diplomats, and lawyers (2014; 2022) and surveys (2014) involving 400 tribesmen in the Internally Displaced Persons (IDP) camps, as well as relevant secondary sources, this chapter, while also referring to South Waziristan where relevant, primarily focuses on North Waziristan, the hub of the US drone campaign.

2 Living Under the Killing Machine

This section will attempt to understand questions related to collateral damage, mental health problems, and the undermining of tribal structures within the context of the US drone campaign.

2.1 Drone Accuracy and Collateral Damage

Several academics support the drone for being an effective weapon against terrorists (Byman 2013; Taj 2010; Plaw, Fricker, and Williams 2010; Ansari 2022; Williams 2014). A number of US officials have also hailed the weapon as accurate and consistent with humanitarian law because it causes lesser civilian harm than other tools of warfare (Koh 2010; Brennan 2012; Hayden 2016).

Agreeing with these perspectives, some interviewees hailed the accuracy of US drone strikes as less destructive than the Pakistani military’s aerial bombing and artillery shelling. A Pashtun senator, stressing that unless there is an in-depth study the real number of civilian casualties will remain speculative at best, nonetheless argued that

"this is the weapon that broke the back of Al-Qaeda, the precision of the drone has improved greatly over time [. . .] while I am certain there is collateral damage [. . .] it is often politicized" (Interviewee 002, 2014). Similarly, speaking on condition of anonymity, an intelligence official who worked at Pakistani military bases used for drone attacks, claimed "they [tribals] are a tough people; not afraid of the drones overhead [. . .] [knowing] it was an accurate weapon" (2022). Echoing similar thoughts, the son of a tribal elder maintained that ordinary people "are sure that the drone is going to target accurately and if they are genuine non-combatants, they have nothing to worry about" (Interviewee 019, 2014).

In the same vein, a former diplomat from FATA pointed out that the Pakistan military's operations were far more indiscriminate than the drone that "targets one house, one *hujra* [at a time]" (Interviewee 017, 2014). Reflecting tribal distrust of the Pakistani state, a tribal student contended that "the drones are precise and rid us of militants whom the army does not [want to] kill" (Interviewee 027, 2014). "Army operations," said a South Waziri student, "destroy markets and affect livelihood, [but] no drone strike has ever targeted the market in Wana [in South Waziristan]" (Interviewee 029, 2014).

Conversely, there were those who questioned the drone's effectiveness. A North Waziri tribal leader argued that "at any given time more than 10, 12, even 20 civilian people are present in the targeted compound [. . .] [innocent]people in close vicinity are invariably killed or injured in drone strikes" (Interviewee 011, 2014). Some incidents have received media attention in this regard. For instance, a 2011 strike on a tribal *Jirga* in Datta Khel, to resolve a dispute over mineral rights, killed 40 civilians including a number of tribal elders (Interviewees 013, 009, 004, 2014; Mazzetti 2013b, 291; Imtiaz 2015, 98). Similarly, a 2006 attack on a seminary in Bajaur killed 80, and a 2009 attack on a funeral in Makin, South Waziristan, killed 83 civilians (Interviewee 014, 2014; Imtiaz 2015, 93; Woods 2015, 159). The author's survey (2014) shows that out of 389 respondents, 54% believe that drones killed more civilians than terrorists. Unsurprisingly, such incidents were perceived by the common people as evidence of the randomness of drone targeting.

A journalist from North Waziristan referred to the Datta Khel and Makin strikes, adding:

> Once I reached the spot [in Datta Khel], I saw dead bodies of children. Their mother and father had also died in the attack. I took some pictures. Then there was the most gruesome attack on the funeral in Makin. There were 81 casualties. They were targeted on the [unfounded] suspicion that Baitullah Mehsud was attending the funeral. Then another attack mistakenly believing Haqqani was there [. . .] [and] the kid, Tariq, who, died in a drone attack strike [in North Waziristan]. (Interviewee 013, 2014)

A school teacher who lost his family members in a drone strike shared his experience:

> On October 24, 2012 US drones launched two attacks on my house in Miranshah. My mother died in the attack [. . .] my nine kids were injured [. . .] I still have the papers to prove the presence of missile parts in the bodies of my children [. . .] There is no vehicular access to our area which is rocky, so how could they claim targeting vehicles near our home? (Interviewee 015, 2014)

A Stanford-NYU report (Global Justice Clinic 2012) confirms the above incidents, explaining that extended families often live in compounds with several houses and the *hujra*, or the main gathering room for males, is often close to the living quarters of females and children. As a result, a strike on a *hujra* and the resultant explosion and shrapnel can cause collateral damage. This was verified by a retired military official belonging to FATA, who argued that "In our tribal area there are mud houses [. . .] and in certain cases the concrete is also used [. . .] the detonation shatters the whole area. So, it is not one room that is destroyed [. . .] [the drone] has become an area weapon" (Interviewee 004, 2014).

Some interviewees (2022) shared knowledge of collateral damage that has not been widely discussed in the media, proving the existence of undocumented incidents. For instance, in the words of a psychiatrist (Mufti 2022) who treated patients from Waziristan:

> A case was brought to me of a journalist suffering from severe PTSD in 2010. He just stepped out of his house for a quick errand when the drone struck his house, killing his mother, wife and six children [. . .] he was under treatment for years. He is a journalist, an educated person who had nothing to do with any militant group.

A tribal student endorsed this view:

> A drone targeted a *hujra* close to our house in North Waziristan. There was a huge explosion. When we reached the site, we saw a woman lying in a pool of blood with her right arm severed from the shoulder [. . .] she was still breathing, so we shifted her to our house where she breathed her last in our courtyard. We knew her well, she was a housewife. (Interviewee D, 2022)

To add to the conundrum some of the high-value targets (HVTs) were reported killed multiple times. Hastings (2012) argues that several civilians were killed in the four failed attempts to kill Baitullah Mehsud, the key TTP commander. The Stanford-NYU report (Global Justice Clinic 2012) demonstrates that Ilyas Kashmiri, the alleged Al-Qaeda leader in Pakistan, was announced killed in January 2009 and again in September 2009 and finally in June 2011. (During the September strike a 15-year-old boy lost both his legs and an eye.) Similarly, Abu Yahya Al-Libi of Al-Qaeda was declared dead in December 2009 and again in June 2012 (Gibson 2014). Yet another report provides details of victims 'killed' more than once (Reprieve UK 2014).

Another major concern pertained to President Obama's sanctioning of double tap strikes, in which a target site is hit multiple times in quick succession, and signature

strikes in which people are targeted because they exhibit an appearance or behavior of a terrorist. One of the key impacts of drone strikes was that they restricted the movement of militants, preventing them from assembling in open spaces and planning attacks (Interviewees 001, 002, 2014, 2022). That said, drone strikes also restricted the movement of common people, affecting their daily lives such as going to school or the market (Interviewee 015, 2014; Interviewees C and B, 2022). Obama's new practices of attack worsened the situation. Mufti (2022) contended that the children were the most affected. This was confirmed by others (Reprieve UK 2013). A young survivor whose skull was fractured in a 2009 drone strike in North Waziristan avoided going to school like so many other children because they feared the drone (Interviewees D and C, 2022).

Criticizing signature strikes, a tribal elder asked how it was possible to tell a civilian from a combatant, "the terrorists don't wear uniforms and carrying weapons openly is part of the Pashtun tradition" (Interviewee G, 2022). Double tap strikes deterred not only the local first respondents, but also humanitarian workers from assisting the injured (Interviewees W and K, 2022; Global Justice Clinic 2012). Clearly, the uncertainty was magnified by new CIA practices. A retired intelligence official (2022) explained that the character of drone warfare varies according to the different rules of engagement followed by the CIA and the American military. Gusterson (2016) underscores the point by arguing that in the case of Waziristan, the targeting protocols were relaxed as the militant movement across the Durand Line became a growing problem. President Musharraf (2014) confirmed that the civilian government that replaced him gave the Americans a free hand. It is therefore likely that the covert CIA-run program caused several civilian casualties. A North Waziri youth stated, "in those days we did not feel secure to go to the markets or drive cars or motorbikes [. . .] we were not sure who might become the next target" (Interviewee H, 2022).

Arguably, collateral damage, despite the professed accuracy of the drone, is a real possibility. How many died? The fatality estimates of the New American Foundation (2021) show that between 245 and 303 civilians were killed, with 211 to 328 impossible to classify. The Bureau of Investigative Journalism (2014) estimate shows between 424 and 969 non-combatant deaths. Coll (2014) puts the civilian deaths between 2,000 and 4,000. A tribesman from North Waziristan argued that reports by foreign think tanks show that "more than 4,000 people have been killed in drone attacks" out of which "barely 60 were known Taliban or Al-Qaeda leaders. Who were the others?" (Interviewee 013, 2014). Another tribal interviewee estimated "95% of those killed" as being civilians (Interviewee 009, 2014).

The above discussion suggests that although the precision of the drone strikes and the killing of terrorists was appreciated by the interviewees, the issue of collateral damage was equally, if not more, a matter of concern. Those who had witnessed drone attacks or had lost family members or sustained injuries, were clearly critical of the weapon. On the other hand, almost all military interviewees were almost unanimous in their opinion that the civilian casualties were politicized, and that the general population supports the drone because it eliminates HVTs. This includes General

Pervez Musharraf (2014) and his ISI chief General Ehsan-ul-Haq (2014), and retired intelligence officials (2014, 2022). While, this may be attributed to their professional assessment, it is possible that the army leadership wanted to defend their decision to cooperate with the CIA. That said, no one denied that innocent people had died in drone attacks, even if their estimates differed.

Interestingly, Christian Wilke (2017, cited in Gusterson 2019) argues that the disagreement over numbers suggests that the accuracy argument might be weaker than proclaimed. Speaking of numbers, a Pakistani lawyer raised an uncomfortable question: “Is one innocent human life any lesser than a hundred?” (Interviewee 023, 2014). Wondering if they were the children of a lesser god, a tribal youth raised another question: “What if armed drones hovered over New York for days, 24/7, and fired missiles only on suspected locations. Would the people carry on with life as usual? There will be international outrage over human rights” (Interviewee D, 2022).

Notably, not all civilians were killed in direct drone strikes; subsequent reprisal killings were just as lethal. In fact, as the US drone strikes increased in 2009, Al-Qaeda created a group of fighters who tracked down and eliminated suspects (Farooq and Kakakhel 2015).

2.1.1 Spying and Other Woes

The US drone campaign in North Waziristan relied not only on aerial surveillance, but more crucially on human intelligence provided by local informants on the ground because the drones needed local assets to identify the target in an area of difficult terrain (Woodward 2010). Evidence shows that human intelligence was not always accurate as tribal score-settling and personal enmities came into play (Intelligence officials, 2014, 2022). The surveys (2014) show 54% do not think that the drone is an effective mode of reconnaissance and 63% are of the view that the drone was not effective in disrupting terrorist activities in FATA. As one tribesman put it, “We have received many dead bodies and voice recordings stating spying as the reason. Sometimes enemies settle personal scores by giving wrong information or by killing under the garb of the Taliban” (Interviewee 013, 2014). As a retired army officer explained, “the role of intelligence agencies is paramount in this warfare and these operations are by definition shadowy [. . .] mistrust is rampant” (Interviewee 010, 2014). Moreover, since the drone had become an effective weapon against the TTP principals, the leadership wanted to discourage spying by using it as a pretext to eliminate suspected tribesmen, and more crucially, tribal elders, to weaken the traditional tribal structure and strengthen their hold.

Clearly, the issue of drone accuracy is not a straightforward one. According to a tribesman, “first drones kill and then Taliban kill innocents accusing them of spying. Yes, drones are more precise than military action. But they act on faulty intelligence sometimes and innocents die” (Interviewee 001, 2014). A tribal student added, “I think

drone strikes have a negative effect over all, even if these are precise or accurate. They depend on intelligence from the ground which is not always accurate" (Interviewee 028, 2014). "Civilians are killed because of faulty human intelligence," argued a tribesman, which is sometimes "provided to the US for financial gains or to settle personal scores" (Interviewee 009, 2014).

Furthermore, the denial of access to due process of law was a matter of concern as perceived terrorists, or their abettors, died in drone attacks. The decision to target and eliminate was based entirely on the choices of security decision-makers, whether in the US or Pakistan. The Pashtun senator who was vocal in his support for the accuracy of the drone, maintained that "in this war there are no surrenders or prisoners of war [. . .] extra-judicial killing is violative of human rights" (Interviewee 002, 2014).

On the other hand, collateral damage included those who survived drone attacks. Among the injured were victims of incineration, burns, and shrapnel wounds, and hearing and vision loss (Global Justice Clinic 2012). Many were forced to dislocate to IDP camps in the urban centers. An interviewee explained, "it is very difficult physically and emotionally to dislocate because [a tribesman's] compound has been there for centuries [. . .] it is three to four generations' effort which they demolish in one drone strike and [you become an IDP]" (Interviewee 004, 2014).

Prashad (2022) argues that drone strikes impact the employment of a region. As well as curtailing communal activities, the attacks added to economic hardship in an already poor region (Global Justice Clinic 2012). For instance, the transportation business, an important source of income generation, suffered because no one could be sure if there was a wanted militant among the passengers (Interviewee G, 2022). Refuting the aforementioned argument of a South Waziristan tribesman that drones do not target markets, a journalist from North Waziristan contended, "Miranshah market has been attacked several times, apparently to target elusive Taliban commanders [. . .] [consequently] the traders and shopkeepers are scared of doing business" (Interviewee 013, 2014).

Clearly, in view of the aspects discussed above, the common people of North Waziristan felt abandoned by the Pakistani state, thus widening the perennial distrust between the state and tribal society.

2.1.2 State-Society Distrust

The feelings of powerlessness and anticipatory anxiety were aggravated as the state was seen as complicit in the foreign invader's drone campaign (Interviewee 010, 2014). "The state," said a tribesman, "is perceived as an ally of the enemy" (Interviewee 012, 2014). Notably, the increase in state-society distrust intensified by drone strikes and collateral damage was manipulated by the TTP to augment its control of North Waziristan (Interviewee 010, 2014), thus diminishing any chances of conflict settlement (Farooq, Lucas, and Wolff 2020).

Moreover, no compensation was offered by the state, although lawyers and human rights activists did raise the issue and demanded compensation (Mukhtar 2015) albeit without success. “We had to sell our lands and take loans from our relatives. Neither the Pakistani nor the US government, paid any attention” (Interviewee 015, 2014). Unable to avenge the deaths and injury of their dear ones through direct action or legal compensation, the people felt abandoned, exacerbating the perennial state-society distrust (Interviewee, 2022).

In the first ever legal response to drone strikes, a Peshawar High Court judgment (2013) ruled that drone strikes violated Pakistan’s sovereignty and were in “blatant violation of Basic Human Rights and provisions of the Geneva Conventions.” The Pakistani government was ordered to take the matter to the United Nations (UN) and request the constitution of “an independent War Crime Tribunal.” Pakistan did approach the UN in December 2013, resulting in the UN General Assembly (UNGA) resolution calling on the US to comply with international law (Express Tribune 2013). This, however, failed to ameliorate relations between the state and a devastated tribal society since the frequency of drone strikes had already diminished from 100 per year between 2010 and 2012 to about half of previous levels in 2013 (Lewis and Vavricheck, 2016).

Another nuanced argument is that local recruitment by militants has sometimes been associated with the radicalization of tribal youth; however, the issue is also, and perhaps primarily, linked to the state-society distrust (Interviewees A, C, G, 2022). Many joined or supported the militants because they were looking for protection for self and family in view of the state’s inability to defend them. So, “sometimes people join them to protect their lives and honor” (Interviewee 029, 2014).

In light of the above discussion, it is safe to surmise that the diverse aspects of collateral damage in drone attacks not only caused physical harm but, as discussed below, also resulted in collective psychological distress.

2.2 Psychological Impact

There is no doubt that ordinary people living under the drones in Waziristan underwent a number of psychological reactions. Seeing violent death, whether of a close family member, friend, or even a militant, was bound to produce the negative effects that human beings go through when faced with bloodshed. Consequently, fear became a way of life in North Waziristan. Fear of sudden death or horrific injury; fear of losing one’s house; fear of forced dislocation; fear of assembly; fear of movement; fear of no recourse to justice or due process of law. Clearly, drone strikes impinged upon fundamental human rights.

The continuous presence of a weapon in the sky and its whirring sound, a reminder of imminent death, could not have been accepted as normal by ordinary people, no matter how accurate the drone is. In other words, it was not just the attack but

also the surveillance activity of the lethal weapon that affected everyday life in North Waziristan. As a tribesman put it:

> Drones are always hovering at 25 to 30,000 feet overhead in North Waziristan and when they are at a lower height there is constant buzzing sound that can be very stressful and frightening for the people [. . .] the loud explosions of missiles hitting targets are equally frightening [. . .] they destroy homes [. . .] moreover drone strikes sever bodies into pieces, which is a very traumatic sight. (Interviewee 010, 2014)

A drone attack is not the same as aerial bombardment, argues Coll (2014). Drones may kill relatively fewer civilians, but they terrorize many more. As a tribal leader told him, drones have an increased psychiatric effect among the population because while F-16s might be less precise, unlike the drone they come and go, thus providing temporary respite.

It is therefore not unlikely that a deep sense of insecurity, abandonment, and helplessness translated into post-traumatic stress disorder (PTSD). A renowned Pakistani psychiatrist who treated 32 drone-related cases between 2009 and 2014 confirmed that:

> The most common psychiatric disorders among the population affected by drone attacks include Depression, Anxiety, Dissociation, Somatisation / Medically Unexplained Symptoms (MUS), Drug Abuse and Misuse. Common psychological reactions seen are Fear, Lack of Control, Blame, Rejection, and Guilt. (Interviewee 005, 2014)

Another Pakistani psychiatrist, who treated 218 drone-related cases between 2009 and 2013, shared the following:

> The main psychological effects include acute anxiety, depersonalization, psychosomatic issues and severe depression. Somatization in women was manifested in headaches and constant fatigue that just would not go away [. . .] Males also suffered from PTSD [. . .] Psychologically the drone's incessant sound affected the hearing of a number of people. Drone attacks even brought about epileptic seizures in people with no prior history, including pregnant women and children [. . .] in 2003 the level of depression in children was 3%; this rose to 9% after drone strikes began. (Interviewee, Mufti 2022)

That the children are the worst affected by the constant and terrorizing presence of drones overhead is also confirmed by local testimonies. A school teacher from North Waziristan endorsed this, saying "since drone attacks started [. . .] children are afraid to go out and play" (Interviewee H, 2022). "I had to shift my children to Bannu and Peshawar to study there. They refused to come home" (Interviewee 015, 2014). A research-based report concludes that the trauma suffered by the children is possibly irreversible. "Entire communities, more than half of which are comprised of children," live in constant fear that death could come "at any arbitrary moment" (Reprieve UK 2014). Living under drones can cause "mass psychological and emotional damage" leading to anxiety, paranoia, and insomnia (Friedersdorf 2012), and there is mounting

evidence of negative psychological effects and socio-economic impacts on women following the killing of men folk in drone attacks (Kennedy, Rogers, and Waldman 2016).

A tribal elder maintained that people were suffering from depression and anxiety due to the constant buzzing sound of the drones. “After all you get disturbed by the constant buzzing of a fly in the room” (Interviewee 008, 2014). In the words of a former diplomat belonging to Waziristan, “the psychological effects of drones was given a local name, *Makhoji*, a disease that spawned restlessness and insomnia. The doctors prescribed sedatives. I saw a little girl in a clinic who would startle at any noise, crying ‘the drone is coming’” (Interviewee 003, 2014). Clearly, not just death but also the “profound psychological consequences” for those living under the “seemingly omnipotent” drone, is a “disheartening” condition (Kennedy, Rogers, and Waldman 2016).

Capturing the state of fear and uncertainty underpinning the daily lives of the common Waziri people, a tribesman said, “the continuous whirring of the drone [is scary] [. . .] nobody knows which compound? which house? which shop? which vehicle is going to be attacked?” (Interviewee 004, 2014).

This was supported by a tribal leader:

> The blast is so terribly powerful that people who are not directly hit also become mentally disturbed [. . .] it is terrifying [. . .] drones are always present overhead [. . .] they create panic [. . .] even if the number of civilian casualties is not that high, the number of psychologically disturbed people is certainly alarming [. . .] [the drone] has consequences beyond the target. (Interviewee 011, 2014)

To sum up, mental health issues were a visible outcome of US drone strikes. This was compounded by a fear of loss of cultural identity already undermined by military operations and militant violence. The drone added to the dilemma by impacting the daily life of common people whose lives had traditionally revolved around the values of *Pashtunwali*. Arguably, the system had many flaws, such as corruption and gender discrimination, but it was functional and had held the society together for decades.

2.3 The Drone and Tribal Structures

The author’s survey (2014) demonstrates that 47% of 389 respondents perceived military operations and militant violence as primarily responsible for undermining the tribal way of life, whereas 29% named the drone as the key reason. Having said that, rising terrorism was perceived by 31% as the major impact of drone strikes on the population. It may thus be argued that the US drone campaign worsened an already explosive situation and impacted upon tribal cultural norms (Farooq, Lucas, and Wolff 2020).

For instance, *Pashtunwali* dictates taking revenge to restore one’s honor whenever the victim of an injustice finds an opportunity to do so (Kakar 2004). That is why it continues from generation to generation. However, in the case of drone attacks and

the ensuing collateral damage to life, limb, and property, a new element was introduced into the lives of the tribal people. The foreign invader attacking from the sky was invisible and beyond the reach of any unequipped common man on the ground. The *badal* (revenge) could be channeled into hatred of the American ally instead:

> Once the drone targets a building or a funeral [killing adult family members] the orphaned children are there to settle the score [. . .] and if the foreign invader cannot be directly targeted then the Pakistani state could face violent reprisal [through radicalization]. (Interviewee 004, 2014)

In the words of a tribesman who lost family members in a drone strike, "when people are not protected by the state, they turn to TTP to get justice [. . .] especially as drone strikes and killings are exploited by local mullahs, ideologues, and madrassahs" (Interviewee 009, 2014).

On the other hand, a Mehsud tribesman explained the militant misuse of another tribal norm to punish anyone allegedly spying to facilitate drone attacks. "*Mrasta* is the concept that if I am your ally, I will fight for you [. . .] but if you betray me then I am justified to fight against you" (Interviewee 018, 2014). Clearly, collateral damage strengthened the narrative of the militants who used the real or exaggerated numbers to exploit the value of *badal*, not only to create terror but also to justify the murder of tribal elders and state functionaries as exacting revenge from the Pakistani state that was complicit in US drone attacks.

Besides *badal*, there were other values of the tribal Pashtun code that the drone undermined. Notably, the *Pashtunwali* values of *nanawatai* or granting sanctuary and *melmastia* or offering hospitality. Anyone seeking sanctuary must neither be harmed nor surrendered to his enemy and the host is honor-bound to protect and defend him even if the asylum-seeker is an enemy. Failure to grant asylum or offer hospitality may compromise one's own right to protection in the community (Ali 2013). These particular values were exploited by the militants and ignored by US policymakers. A tribesman summed it up:

> If an Al-Qaeda member or anybody knocks at my door at night [asking for] food and shelter and it is in my blood and in my custom to provide it, then I am honor-bound to do so [. . .] [but] if a drone targets him and I being an innocent host, am also taken out along with my children, is that justified? *Pashtunwali* [should have been] taken into account [by the US]. (Interviewee 004, 2014)

To this, another interviewee added that "in the past people knew who was who. Now the tribal system gradually eroded as the militants walked in to save their skin" (Interviewee 003, 2014).

Furthermore, from the cultural dimension the drone was perceived by many as violating the norm of *pardah*, or privacy especially linked to women, and which a Pashtun is duty-bound to protect. Keeping in mind that Waziristan has a low literacy rate, a medical practitioner stated, "many tribal patients perceive drone attacks as a threat to their '*pardah*' [. . .] some of them believe that drones take photographs and

make videos of what people are doing [. . .] females believe that the drone may be making their 'films' while they are bathing" (Interviewee 005, 2014).

Even the physical destruction caused by drone attacks was perceived through the cultural lens, as manifested in the following response of a tribesman: "our houses are built in phases [. . .] for instance, my great grandfather built a big room [. . .] my grandfather later added a *hujra*, my father planted an orchard [. . .] and so on [. . .] so when the drones destroy a house, they destroy our legacy [. . .] our tradition" (Interviewee 012, 2014).

More significantly, the institution of *Jirga* or the culturally accepted method of conflict resolution was affected. The tribal elders have traditionally played an important role in FATA, with thousands being elected for *Jirga* from their villages. The drone attacks invited TTP retaliation against the tribal elders, accusing them of being government spies. The loss of many tribal elders meant that there was no influential intermediary between the state and the TTP. Moreover, a foreign policy element was introduced by the drone, and the domestic institution of *Jirga* had no power to cope with it. Consequently, the erosion of the institution of *Jirga* destroyed local capacity to deal with the brutality and chaos (Farooq, Lucas, and Wolff 2020).

How many tribal elders were killed? Different accounts and estimates put the number anywhere between 85 and 1,500 (Kakar 2014). A tribal interviewee argued that even if the drone is accurate, it is counter-productive because tribal elders "[either] no more exist [or] a great number has left the area" (Interviewee 001, 2014). This was confirmed by a number of tribal interviewees from different walks of life (Interviewees 001, 002, 008, 010, 013, 014, 016, 018, 019, 021, and Group Interviewees 026–030, 2014).

To sum up, the impact of the US drone campaign goes beyond physical harm and psychological or psychiatric issues. It includes the weakening of tribal norms subsumed within *Pashtunwali*. The destruction of tribal structures and the loss of control are neatly summed up in tribal poetry:

> *The foreign superpower uses drones to wreak havoc in my land*
> *Being on the receiving end, I can only write poetry.*

3 Concluding Thoughts

This chapter has attempted to understand the physical, mental, and cultural plight of common people living under drones in Waziristan. Professed precision notwithstanding, drone strikes did result in collateral damage, both in the form of direct killing and spy-related reprisals. Furthermore, the basic rights to life, property, movement, and due process of law were undermined.

Pakistani military operations and TTP brutality resulted in civilian deaths, infrastructure destruction, and the undermining of tribal structures. This inflamed the mutual state-society distrust. The CIA-operated drone campaign added to the phenomenon

as the Pakistani state, by providing military bases and intelligence, was seen as duplicitous by the Waziri population. With no help coming from the Pakistani state, people on ground felt vulnerable and abandoned.

Already traumatized, the ordinary men, women, and children were exposed to the new phenomena of constant surveillance, signature strikes, and double tap strikes. Moreover, the covert drone campaign lacked transparency and accountability and offered no compensation. Unsurprisingly, this aggravated and created mental health issues in the older and younger generations. Their way of life under *Pashtunwali*, already compromised by military interventions and militant ideology, was further undermined by the drone. The tribes' inability to respond to a foreign invader was in violation of the tribal honor code and spawned humiliation and guilt. Sadly, there has been no proper investigation of civilian casualties and property destruction by the American or Pakistani governments; nor has either government offered compensation to the victims.

To conclude, the arguments presented in this chapter raise questions about the efficacy of covert drone operations as a counterterrorism tool, which in this case, has failed to win hearts and minds.

Seminar Questions

1. Do you find persuasive the argument that despite being accurate drone attacks generate psycho-social effects?
2. How credible is the evidence that the author presents to demonstrate a correlation between the tribal perception of drone attacks and the cultural tenets of *Pashtunwali*?
3. How would you assess the implications of collateral damage for US security objectives in Pakistan?
4. Do you think there was an alternative to US drone strikes in North Waziristan?
5. Can you think of other factors, in addition to drone attacks, that contributed to the state-society distrust in the tribal region of Pakistan?
6. What are the strengths and weaknesses of the argument that the covert nature of drone attacks in North Waziristan served as an effective counterterrorism tool?

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Note: All interviews (2014) and surveys (2014) were conducted for the ESRC-funded project on the political effects of UAVs at the Institute for Conflict, Cooperation and Security (ICCS), Birmingham University, UK. The 2022 interviews were conducted exclusively for this chapter.

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15 The Media and Drone Warfare

Abstract: Witnessing is crucial to public engagement with war, but the remote violence of drones presents distinct challenges: its victims are largely invisible to Western publics; operations are cloaked in secrecy; and promises of precision targeting, accurate surveillance, and legal monitoring obscure the brutalities of the system. With so many barriers to witnessing, remote warfare tends to remain on the periphery of political debate and has not occasioned widespread resistance. Yet the means for witnessing drone warfare exist; the question is how they might be leveraged to make remote war more accessible and contestable. This chapter analyzes the high-profile drone strike that killed 10 civilians in Kabul on August 29, 2021 to consider the limits and possibilities of witnessing drone strikes, alongside the database of conflict monitor Airwars and the aesthetic practice of the research agency Forensic Architecture. It argues that witnessing drone strikes requires assembling new conceptual techniques with long standing practices of media witnessing and human rights testimony. It is not a manual or primer but rather maps four critical, analytical, and ethico-political trajectories demanded by the problem of how to witness a drone strike: lived experiences, violent mediations, infrastructural scales, and aesthetics.

Keywords: Drone warfare, witnessing, aesthetics, remote war, assemblage, mediation

1 "A Righteous Strike"

On September 10, 2021, the *New York Times* published a video investigation of a drone strike that had killed 10 people in Kabul on August 29 amidst the withdrawal of US troops and personnel from the country (Aikins et al. 2021). Combining on-the-ground interviews, smartphone footage from the scene, forensic analysis of security camera footage and satellite maps, and expert commentary on the blast site, the investigation showed that the target of the strike – Zamairi Ahmadi – was a technical engineer working for an American aid organization. Seven children were among the others killed. Three days after the strike, US General Mark Milley, Chairman of the Joint Chiefs of Staff, had declared it "a righteous strike" against members of ISIS-K, the group responsible for a suicide bombing at the Kabul Airport that killed 13 Americans and 170 Afghans a few days earlier. But as the *Times* investigation showed, the strike

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was like so many others in the 20 years of lethal surveillance of Afghanistan: reliant on atmospheric remote sensor surveillance without verification from the ground.

That day, 43-year-old Ahmadi had driven his white Toyota Corolla on a circuitous route through Kabul, which the *Times* marked on a satellite map of the city (Figure 15.1): collecting a colleague and his boss's laptop before arriving at the offices of Nutrition and Education International, an aid organization headquartered in Pasadena, California. Security camera footage showed Ahmadi going about his daily work (Figure 15.2). What the military claimed were containers of explosives were shown to be containers of water, filled to take back home where there was a breakdown in supply. Colleagues and family members attested to the impossibility of Ahmadi's association with ISIS-K and to the brutal horror of the strike, the devastation of losing so many children. Weapons experts verified that the there was no evidence of a secondary explosion at Ahmadi's home beyond the car's fuel tank, which might have given credence to the military's claim that the car contained explosives. What likely killed 10 innocent people was correlation, coincidence, and the lethal logic of remote warfare itself: a white Corolla, proximity to an alleged ISIS-K safehouse, and movement that a suspicious and jittery military interpreted as threatening through its own warped matrix. Carefully assembled into a persuasive 10-minute video that enabled publics and policymakers around the world to witness the violence of the strike, the *Times* investigation pushed the US military to accelerate its own. On September 17, the Pentagon acknowledged that the strike had been a mistake, and that almost everything they had claimed about Ahmadi and his movements was wrong. Later, on January 19, 2022, the *Times* used the Freedom of Information Act to obtain raw footage from three unmanned aerial systems involved in the operation, providing a rare glimpse inside the visual apparatus of infrared and full-motion optical video available to military drone operators. The visibility of the strike, the detailed and well-resourced investigation and sustained media scrutiny, and the public attention that followed all combined to produce a rare instance when the violence of drone war was brought home to American and other Western publics.

In Afghanistan and the neighboring Federally Administered Tribal Areas of Pakistan, at least 13,500 drone strikes have been conducted since the first Hellfire launched from an unmanned vehicle at a live target on October 7, 2001 (Woods 2015). No one knows the total number of civilian deaths but estimates of several thousand in Afghanistan and Pakistan alone are likely on the low end. No one knows because very few have been closely investigated by Western media or the Department of Defense, and the communities wounded by such strikes often lack the resources to make their lived experience visible and legible to wider audiences, particularly when disclosures by the Pentagon are sparse and sparingly published, particularly in the Trump era. Survivor testimonies collected by human rights groups, whistle-blower reports, the advocacy of Drone Wars UK, Code Pink the ACLU, and the artists, activists, and protesters have played crucial roles in maintaining critical attention on drone war despite its tendency towards invisibility. So too have new conflict monitoring agencies such as Airwars and Syrian Archive, which use open-source investigation techniques to collate, verify, as-

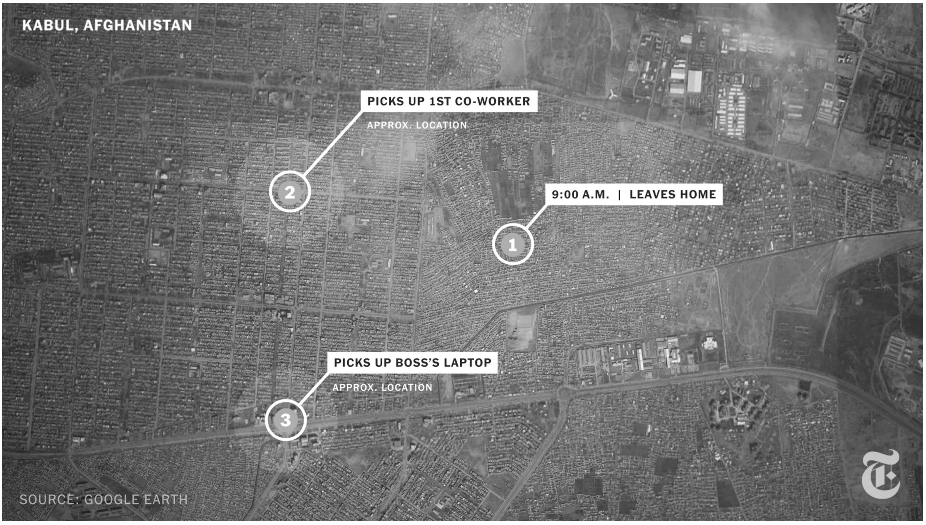

Figure 15.1: Screenshot showing Ahmadi's movements from *New York Times* Investigation: "In U.S. Drone Strike, Evidence Suggests No ISIS Bomb" © New York Times, 2021.

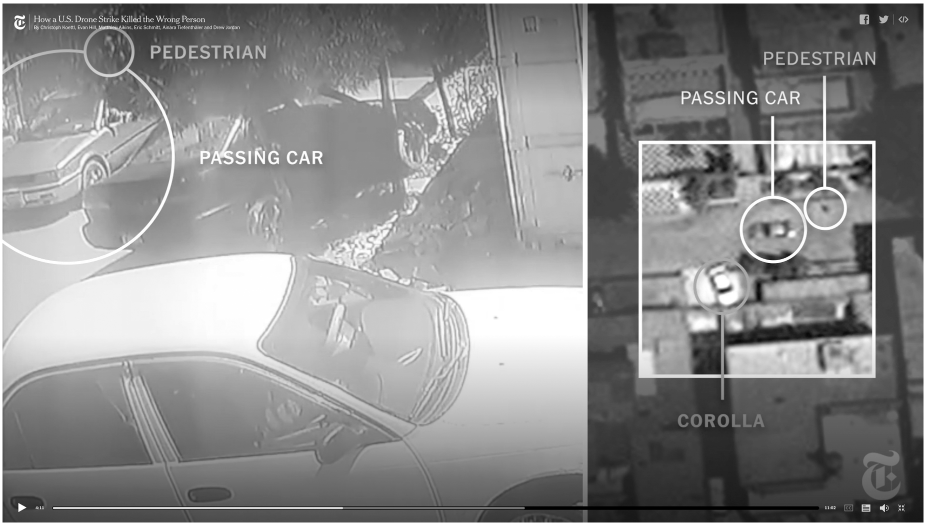

Figure 15.2: Screenshot showing CCTV camera footage from *New York Times* Investigation: "In U.S. Drone Strike, Evidence Suggests No ISIS Bomb" © New York Times, 2021.

sess, and publish imagery, accounts, and geolocation data of military violence using social media, local journalists, and other sources to make on-the-ground knowledge more accessible. Occasionally strikes such as Kabul in 2021 or the wedding procession in Haska Meyna in 2008 become "rogue intensities" that grab the interest of distant pub-

lics (Kaplan 2018, 36). But such instances are rare, despite the best efforts of critics, communities, and NGOs. Drone strikes and the apparatus that makes them possible remain shrouded in discourses of precision and largely unwitnessed by Western publics, even as remote warfare has become the major strategic approach of the US and other advanced militaries.

Witnessing drone strikes requires assembling new conceptions and techniques with long standing theories and practices of media witnessing (Frosh and Pinchevski 2009) and human rights testimony (Givoni 2016). Witnessing war is a vital task, bringing distant and often unimaginable violence to the domestic sphere. Witnessing makes claims about the meaning and significance of an event, not just in the instance of witnessing itself but in how events take on meaning through the belated bearing of witness and the testimony this act produces – even if the claims of testimony are always and necessarily contestable (Schuppli 2020). Witnessing a drone strike must remain an incomplete task, since human witnesses can only ever offer an incomplete and subjective perspective, forensic analysis depends on intimate access to the site of violence, and the technical apparatus of drone warfare will likely remain shrouded in military secrecy. While the US military occasionally conducts its own investigations, as it did in Kabul, much remains obscured through the national security classification of systems, personnel, and processes. Media witnessing enabled by journalistic investigation and the proliferation of user-generated content provides crucial insight, but while the former is limited by resources and access, the latter often require verification or corroboration to obtain authority and can be extractive by virtue of its intermediary position (Ristovska 2021).

Media coverage of the invasions of Afghanistan and then Iraq rendered the aerial view familiar, training publics to recognize and decode new ways of seeing. Drone vision "invited publics to see the drone war through the very apparatus that prosecuted it," but in doing so "framed out those populations who must live and die under this new regime of aerial occupation" (Stahl 2018, 68). Witnessing drone warfare is not solely a matter for news media; it is also a cultural and political problem that intersects with artistic practices, activist politics, and the conflict monitoring and human rights work of non-government organizations. My contention is that such practices need to be complemented not only with attention to aesthetic modes of testimony, but also the nonhuman entities, agencies, and processes that make drone strikes possible, or are simply caught up in them. At present, the prevailing humanitarian discourse shapes what counts as witnessing and who (not what) can stand witness, so in part my purpose here is to urge an approach to witnessing conflict that moves beyond humanitarianism to embrace nonhuman technics, ecologies, agencies, and processes. As such, this chapter maps the critical, analytical, and ethico-political trajectories demanded by the problem of how to witness a drone strike: *lived experience*, *violent mediation*, *infrastructural scale*, and *aesthetics*. But first: the problem of witnessing remote warfare.

2 Witnessing Remote War

Witnessing war has a long and complex history, but remains critical to public understanding, engagement with, and response to martial violence. Testimony, which occurs after the act of witnessing and makes what was witnessed manifest and communicable, can make war known or at least knowable by producing knowledge, providing a moral and ethical response to violence, and addressing power with countering claims as to what took place (Givoni 2016). Witnessing that leads to testimony thus makes contestation in public forums possible: the court, the tribunal, the parliament. "Making distant wars visible typically depends on representational strategies that emphasize differences of place and time," observes Wendy Kozol (2014, 6), which tend to reproduce pre-existing discourses, and affects that divide self from other and friend from foe. What, then, are we to make of the radical limitations that beset the witness to drone violence? Violence precedes and exceeds the event of the strike itself: the violence begins well before, in the processes of datafication and correlative analysis that produced potential targets for killing, and continues after, in the enduring trauma of direct survivors and in the major and minor disruptions to collective life that living within the ambit of remote war produces (Tahir 2021; Edney-Browne, 2019). Even if such dispersed violence were made visible, large swathes of the apparatus itself would remain only narrowly explainable due to their algorithmic nature (Amoore 2020).

While witnessing was once performed through speech and song, media technologies from the printing press to the television to the smartphone have transformed how war is witnessed. Witnessing increasingly centers on the visual. "Eyewitnesses and survivors today retain powerful cultural authority as embodied witnesses," but most people engage with distant military conflicts through visual imagery (Kozol 2014, 6). While law, religion, and human rights give witnessing moral force, John Ellis argues that "television sealed the twentieth century's fate as the century of witness" and made it a "domestic act" (Ellis 2000 in Peters 2001, 708). Witnessing became a "generalized mode of relating to the world" (Frosh and Pinchevski 2009, 9), even as the lines between spectatorship and witnessing blurred or collapsed altogether (Chouliaraki 2006). Witnessing contemporary war demands attending to the ambivalence of witnessing (Kozol 2014), to the ways in which it reinforces and re-inscribes the desires of states or offers frictional or opposing claims.

Remote warfare is not just distant in space and time but removed from view by technocratic discourse and its distributed architectures of violence (Bousquet 2018). For Jens Ohlin, remote warfare encompasses drones, autonomous weapons and cyber, and is characterized by "allowing operators to use ever more discriminating force while also receding further in time and space from the target of the military operation" (2017: 2). Remote warfare is profoundly asymmetric, exemplifying a necropolitics in which "weapons are deployed in the interest of maximum destruction of persons and the creation of death-worlds, new and unique forms of social existence in which vast populations are subjected to conditions of life conferring upon them the status of living dead"

(Mbembe 2003, 40). For the US, remote warfare is appealing because it enables military action at almost any point on the planet without the exposure of its own soldiers to immediate harm. By removing soldiers from the field of battle, it also removes publics and even policymakers from intimate relations to martial violence. Without body counts and flag-draped coffins to focus attention, remote warfare can operate under far less scrutiny than America's wars in Vietnam or Iraq. This remoteness is possible because drone warfare is also highly technical.

All this points to the limits of what media witnessing and the situated testimony of survivors can do in the face of networked, distributed, and often-invisible structures and processes of war. Witnessing needs to be understood as fleshy and affective, as well as imagistic and discursive (Chouliaraki and al-Ghazzy 2021; Papailias 2016; Richardson and Schankweiler 2020), but also as material. Material witnesses are "nonhuman entities and machinic ecologies that archive their complex interactions with the world, producing ontological transformations and informatic dispositions that can be forensically decoded and reassembled back into a history" (Schuppli 2020, 19). Taken together, witnessing drone strikes – and, indeed, witnessing remote warfare more generally – requires attending more closely to these nonhuman traces, agencies, and entities, while not neglecting the experiences of survivors.

3 How to Witness a Drone Strike

While the elements of a drone strike might be registered by a vast array of materials, systems, persons, and ecologies, the bearing of witness – the communicative act of giving testimony – will necessarily be circumscribed. This might be through a lack of living eyewitness from the site of the strike, or through the blackboxing of technical elements within the drone apparatus. The short answer to the question of how to witness a drone strike is by widening the ambit of what counts as witnessing, witness, and testimony – but in practice it also means attending in more fine-grained, relational, and situated ways to the witnesses and evidence we already recognize. And it means pursuing the transversal relations that bind the system together, even when those relations are disjunctive or tenuous. The four brief forays into sites of inquiry for witnessing – the trajectories I am calling lived experience, violent mediations, infrastructural scales, and aesthetics – are thus intended as openings onto an approach to witnessing remote warfare that extends the limits of knowing that too often circumscribe attempt to witness its violence

3.1 Lived Experience

Drone strikes are swift, kinetic violence but their aftermaths endure, rending and reshaping the lived experience of those who lived under them. Witnessing drones strikes requires attending both to the immediate consequences of lost lives, injured people, and damaged cars, homes, and lands, but also to ongoing damage to the fabric of social, cultural, and political life. Drone war's aftermaths are intimate, contested, and unruly; etched in stones, buildings, gardens, and bodies; seared into the fabric of communities and cultures. Witnessing a drone strike thus entails both the elevation of voices from the ground, but also close attention to the material, ecological, and cultural harms perpetuated by the ever-present potential of violence from above.

The testimony of survivors carries with it an urgent, even moral, force that provides media reportage and investigation with a certain standing. Yet this moral standing is not enough alone: such situated testimonies are readily available from Afghanistan, Pakistan, Yemen, Libya, Gaza, and other sites in the reports of human rights organizations and conflict monitors. Accounts by American drone pilots and sensor are not hard to find, whether in media (Linebaugh 2013) or testifying at the UN (Scahill and Greenwald 2014). Yet merely speaking does not mean that such witnesses will be heard or believed. In drone warfare, the politics of listening hinges on which voices count as worth hearing (Dreher 2009). In Kabul, Ahmadi's family and the reporters who rushed to the scene were able to lay claim to the meaning of the event with a temporal and spatial immediacy that lent them authority. But most drone strikes occur far away from the notebooks and lens of Western media, recorded instead by survivors or the local community and filtered to the wider world via social media.

Bearing witness to the experience of life under drones makes clear the deep social and cultural wounding they produce. Ahmad, a 21-year-old Afghani from Wardak, says that "life is like being in a prison. But the prison is big. You cannot meet at night, go for dinners, you cannot move easily and without fear – you cannot continue to perform your culture and your celebrations" (Edney-Browne 2019, 1351). Wahab, also 21, describes the shame of being watched from above: "We would have the curtains and the doors of our house closed to try to prevent their recording [. . .] but this is useless because still we had to walk outside our houses – and when we did, we didn't feel relaxed. Every individual action of ours they were recording" (Edney-Browne 2019, 1351). Such testimonies expose the slow violence of drone warfare, its dissolution of tradition, its fracturing of community, its gradual alienation of people from lives lived prior to its arrival. This collective experience also points to the importance of contextualizing drone violence within the specifics of history. In Afghanistan and Pakistan, that means making evident the enduring impacts of British colonialism on law, politics, and even the borders of states (Ashraf and Shamas 2020), as well as the neo-colonial geopolitics practiced by the US state.

Constant awareness of the lethal surveillance (Kindervater 2015) of drone warfare limits or denies access to public space, which in turn depoliticizes through social isola-

tion. Combined with trauma, declining mental health, and the erosion of traditional community activity and governance, this leads to what Edney-Browne calls "self-objectification," in which Afghan people begin to conceive of themselves as objects of surveillance (2019, 1353). Surviving entails reworking relations of community and the movements of daily life in counter-rhythm to the algorithmic operations of intelligence gathering and analysis. Disruptions to daily life and its communal governance are matters of space and movement, as well as custom, ritual, and routine. No longer socializing after dark, no longer holding community gatherings, no longer undertaking funeral rites: these are restrictions on mobility dictated by the uncertainty of violence from the air. Those on the ground cannot avoid the destabilizing and disjunctive noise, grating as it moves from waves in the air to vibrations in the body.

But the material traces of drone warfare can exceed both sound and voice. Lethal strike survivor Idris Farid describes "pieces – body pieces – lying around" and the effort to "identify the pieces and the body parts" to determine "the right parts of the body and the right person" (Stanford Law School and NYU School of Law 2012, 74). In an attack on a village in Yemen, that distinguishing between animal, child and adult was often impossible (Pugliese 2020). While the targeting systems and discourse logic of drone warfare dehumanizes through gendering and racializing techniques, such as the presumption that Afghan military-aged males constitute valid threats (Wilcox 2017), its violence strips its victims of any corporeal distinction from other animals. Even the land is scarred. As one survivor put it, "the entire place looked as if it was burned completely," so much so that "all the stones in the vicinity had become black" (Stanford Law School and NYU School of Law 2012, 108).

While mobilization within a framework of laws typically depends upon a speaking subject, the registration of violence enacted on the sites of drone strikes constitute a form of witnessing that both precedes and exceeds the human. It precedes the human because ruined flesh, scarred rock, and shattered plant life is already witnessing in the instant of explosion, itself preceded by the air's mediation of light in the collection of sensing data and of force in the on-rush of Hellfire missiles. It exceeds the human because this witnessing occurs below the threshold of detectability – in the faint striations of dirt subject to passing shrapnel, in the misting of viscera, in the ephemerality of heat – and far outside it too, in the elusive scale of the drone apparatus itself. The lived experience of drone strikes is not reducible to the voices of the people who live under them, but rather calls for more expansive engagement with more-than-human ecologies.

3.2 Violent Mediations

Drone strikes do not begin with the explosion of a Hellfire AR-114, or even with its launch from a loitering Reaper. Witnessing drone strikes necessitates tracing the emergence of the act of violence in and through the media-technological apparatus of

the drone. What makes drones efficacious is their sensing capacity, their ability to mediate the stuff of the world into information and facilitate its analysis and exploitation. Mediation is more than simply representation in media, but "a performative enactment in time" that "involves demonstrating, putting forward, or bringing to life as much as it involves representing or depicting something that has happened" (Parks 2018, 2). While the drone's motility means that it is constantly mediating the atmosphere around it, connecting to GPS infrastructure, and managing control signals, the mediations that most urgently witnessing are those violent mediations that make drone violence possible (McCosker and Wilken 2020). Violent mediation names those material connective processes that are constitutively harmful, whether because they cut, target, exclude, define, categorize, or classify in ways that are injurious to human or nonhuman entities and environments. The killing of Zamairi Ahmadi depend on precisely these kinds of violent mediations: correlating movement without context; targeting systems that transform complex lives into pre-emptive targets; random forest algorithms that autonomously analyze data; remote sensor systems that provide narrow viewpoints re-imagined as god-like. In much media witnessing, including the coverage of the strike in Kabul, much of these technics remain obscured. To an extent, this is understandable as so much of remote warfare is blackboxed, either by military secrecy or its technological form. But as I will suggest below, even the tightly enclosed processes of threat identification algorithms can be approached in ways that open lines of witnessing potential.

We might think of violent mediation as the connective tissue of military systems, constituting sensing at the material level of technical operation but also stitching sensing into larger apparatus: the thermal camera of the drone sensing its environment entails violence within its mediating processes, but also in the translation from sensing (thermographic camera) to imaging (decoding for optical display) to targeting (fixing of the reticule on an agglomeration of pixels). Processes of mediation occur within each stage, but also across them and throughout the kill chain. Attending to violent mediation thus means focusing on the movement, use, and structuring of information within the military apparatus, as well as within the elements that compose it. In the *Times* investigation of the Kabul strike, these violent mediations percolate below the surface but don't come to fully to the fore. The investigation is explicit about the tenuous nature of intelligence gathering and the dangers of correlating data points like driving a white Toyota Corolla and making multiple stops, but the architectures that make that possible don't materialize. Even the raw drone video footage obtained by the *Times* (Figure 15.3) offers limited insight: parts of the screen are blurred to redact navigation and sensing information and it's unclear from the footage whether the quality has been degraded to protect drone vision capabilities.

Witnessing a drone strike must also precede the launch of any missile. Over Afghanistan and the regions of the Federally Administered Tribal Area (FATA) of Pakistan, drone strikes fit into two broad categories. While 'personality strikes' target specific individuals identified by the US state as threats (alleged terrorist or insurgent

Figure 15.3: Screenshot of raw drone video obtained by the *New York Times* © New York Times, 2021.

leaders, for example), 'signature strikes' are activated when emergent patterns in accumulated data about movement and communication cross a certain threshold on a predefined decision matrix. Collected by drones carrying the GILGAMESH system, metadata from cell phone tower check-ins, calls, and texts is analyzed by SKYNET software to identify "patterns of life" that could be mapped to potential threats or targets of interest (Pugliese 2020). This is the logic of pre-emption, in which the "deferred future is collapsed into the present so it can be acted upon now" (Andrejevic 2019, 86). Pre-emptive martial technics elide the specificities of the texture of life in favor of what can become operationally subject to tools that identify risk and act to eliminate it (Amoore 2013). Within SKYNET, a narrow set of data points – most of them drawn from cell phone signal interceptions – provides the basis for algorithmic analysis using a machine learning technique called a random forest, which uses probability trees for various data relations and outcomes to produce predictions. Such an algorithm doesn't witness in the sense of 'knowing' or 'experiencing' that we might grant the humans operating the drone apparatus or subject to its violence, but "mobilizes proxies, attaches clusters of attributes, and infers behaviors to target and to act regardless" based upon a singular output (Amoore 2020, 127). Yet this mobilization of relations must be witnessed as a critical animating element within the violent mediations of drone war. Creating the conceptual space for algorithmic intensities, relations, and systems to understood as enacting nonhuman witnessing is crucial, but so too is tracing their affects and effects. Here, then, the reworking of social and cultural

relations in response to drone operations takes on a further significance, since it becomes a kind of collective witnessing of what the algorithms do.

3.3 Infrastructural Scales

If the processes of violent mediation through which drone strikes are enacted needs to become part of our witnessing assemblage, then so too the socio-technical infrastructures that enable the drone apparatus. These drone infrastructures encompass material objects and technologies, but also organizations, procedures, standards, practices, and individuals. Drone violence takes place remotely, but this physical distance between soldier-operators and their targets is bridged by a planetary infrastructure of atmospheric satellites, undersea optical fiber, military bases, institutional procedures, technical protocols, and legal frameworks, to name just a few of the elements that connect the aerial platform to its ground control station and govern the flow of information and action within the system. While the basic architecture of such systems is by now broadly known, these infrastructures entangle additional actors into the fray – Germany, for example, which hosts the pivotal Rammstein airbase signals station – but at a more systemic level point to the infrastructural scale of drone violence. Infrastructures of remote warfare are not simply activated in the event of the strike, but are the precondition for its occurrence and for the topological transformation of war itself (Sear 2020). While the scale of such infrastructures is implicit in the *Times* investigation and other coverage of Kabul, media witnessing tends to position these infrastructures as background conditions in favor of the essential task of foregrounding the lived experience of survivors. However, witnessing drone strikes calls for a more engaged accounting with the global scale of its infrastructures. Sustained attention within media reportage of the network of American bases and allied facilities required to conduct drone operations would be one starting point. But there is also the necessity of bringing the social, political, legal, and other infrastructures into view and to understand these as constitutive of drone violence.

In the mediatized spectacle of Soleimani's assassination, the (geo)political and legal infrastructures that enable drone warfare became visible because targeting a senior military leader of another state made the strike exceptional. In the American broadcast media coverage and in the commentary that carried over into blogs, opinion pieces, and academic articles, questions of legality (Ferro 2020) and political implications were repeatedly raised (Binkaya 2020; Jahanbani 2020). Here, it seemed, the geopolitics of drone warfare came into view because the victim of a strike was *already* political rather than rendered outside politics by the necropolitical nature of the apparatus itself, which predetermines those subject to its gaze as able to be killed. Claims of Soleimani presenting an "imminent threat" were retracted by the US, in favor of an argument regarding the ongoing threat posed by the Iranian Republican Guard (US House Foreign Affairs Committee 2020). Bringing these legal-political infra-

structures into the frame of media witnessing represented a rare instance in which their dynamic agencies were recognized as necessary to a full accounting of the strike against Soleimani. For publics to witness such a strike entailing state responsibility, the enabling agency of legal infrastructures needed to be grasped.

But witnessing remote warfare can also develop its own infrastructures, which hold untapped potential for distant and targeted publics alike to participate as co-witnesses to both individual strikes and the scale of aerial violence, countering the asymmetries of information and the discontinuous nature of media coverage of and public engagement with remote warfare. The UK-based conflict monitor Airwars maintains a database of over 60,000 civilian harm incidents from aerial warfare across the greater Middle East and North Africa (Airwars n.d.). Its information is sourced from social media and local reporting, with expert researchers and assessors responsible for collating, analyzing, and presenting evidence within the incident template of the database housed at www.airwars.org. While Airwars partners with journalists and media organizations for investigations, its core work as a conflict monitor involves identifying, collating, aggregating, assessing, and publishing civilian harm events as database entries. Airwars relies on an established methodology to produce a kind of witnessing infrastructure of technologies, expertise, standards, and institutional networks that foregrounds voices and images from the site of drone and other air strikes (Airwars n.d.). By producing documented accounts of aerial harm to civilians, Airwars creates both a mechanism for individual demands for accountability and the means to relate voice and embodied experience to the geographical distribution and scale of remote warfare.

While not itself an agency for seeking restitution, Airwars database – and its influence on US civilian harm disclosure policy – can be as materially efficacious as any investigation by the *New York Times*. While both the Kabul investigation and the Airwars database make clear the necessity of attending more to voices and bodies on the ground, they also signal the necessity of a more expansive, relational approach that seeks to knit individual strikes into the broader fabric of remote warfare. Airwars catalyzes the witnessing of warfare on the ground – captured in images, videos, and testimonies uploaded to social media or reported on by local journalists – into a larger information architecture, making it accessible to distant publics, policymakers, and militaries. The unvarnished and often brutal nature of the images and accounts combines with the verification methodologies and presentation standards enacted by the database to situate individual events within the larger terrain of aerial and drone warfare (Ford and Richardson 2023). Here, then, the infrastructural scale is harnessed to counter the distributed and networked nature of such violence, making a distributed and infrastructural witnessing possible.

3.4 Aesthetics

Common conceptions of aesthetics limit its meaning to the apprehension of beauty, particularly in art, but aesthetics can be understood in more fundamental terms as a dual process of sensing and sense-making. That is, aesthetics describes how experiences of the world are sensed and how knowledge is produced from that sensing (Fuller and Weizman 2021, 35). There is an aesthetics to the witnessing of drone warfare within the military apparatus: the array of screens, the latency of imagery, the multispectral capacities, and the narrow fields of view afforded by the 'soda straw' camera of the drone, all layered over by the algorithmic apparatus of target identification via pattern analysis. Such an aesthetics presents itself as precise and hyper-technical but is remarkably prone to errors. Like the processes of violent mediation to which it is yoked, the sensing and sensing-making mechanics of the drone apparatus shape the knowledge claims that authorize drone violence.

To witness a drone strike from a ground control station outside Las Vegas is to do so within the aesthetic capacities and constraints of the system: to testify to threat, to watch the strike unfold. Focalizing infrared radiation through lens and onto the microbolometers assembled one-per-pixel into the sensor itself, thermographic cameras must manage wider wavelengths than their optical counterparts. As the raw footage from August 29 reveals (Figure 15.4), when a missile strikes the combination of limited resolution and intense heat prevents infrared sensors from doing anything but assigning maximal intensities – computer vision cannot resolve what it cannot sense. Whether in optical or infrared, this incapacity to capture the event of the strike means that drone sensors necessarily repeat the erasure of life at the level of sensor process. Not only are these sensors overwhelmed, but latency within the network also means that the drone apparatus can only ever witness on a 2–6 second delay. Whatever appears on screen does so with the event already in the past, not real-time but still live in the sense that the drone system always experiences liveness on delay. Distance vanishes, but time dilates. Drone systems intensify this tension between occurrence and technical mediation: an elastic temporality brimming with violence.

There is a second sense in which aesthetics enables the witnessing of drone violence. For the research agency Forensic Architecture, aesthetics opens up an investigative mode that can address what founder Eyal Weizman calls "violence at the threshold of detectability" (Weizman 2017). For Forensic Architecture, "making sense involves constructing means of sensing," typically computational techniques of modeling, mapping, analyzing, and geolocating (Fuller and Weizman 2021, 36). In one of their earliest investigations, "Drone Strike in Miranshah," mapping is used to make visible the split-second violence of a drone strike on a home in Northern Waziristan. Beginning with fragments of mobile phone footage aired on MSNBC, the investigation used this footage with satellite imagery to locate the specific structure, undertook pattern analysis of footage that showed the room struck but the Hellfire missile, and then used 3D modeling to build a replica of the space (Figure 15.5) and reveal the mid-air position of explosion

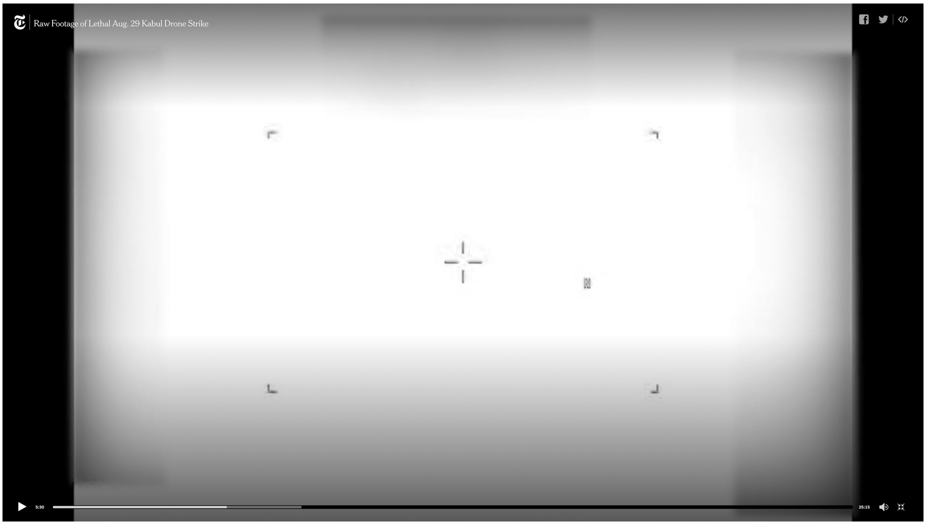

Figure 15.4: Screenshot of raw drone video obtained by the *New York Times* © New York Times, 2021.

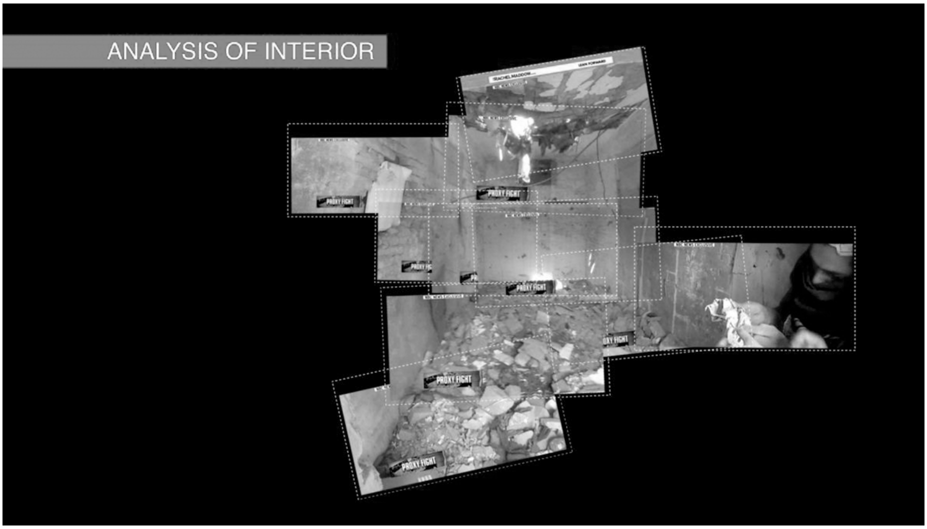

Figure 15.5: Composite image of interior, from stills from MSNBC footage. (Forensic Architecture; MSNBC) © Forensic Architecture, 2021.

and demarcated 'shadows' that likely signaled the position of bodies that absorbed the shrapnel before it could strike the walls (Figure 15.6).

In "Drone Strike in Miranshah," the aesthetic capacities of walls, smartphones, and computer models each work in different ways to produce a witnessing assemblage. The shaky camera, capturing the fear of the observer; the scarred walls; the satellite imag-

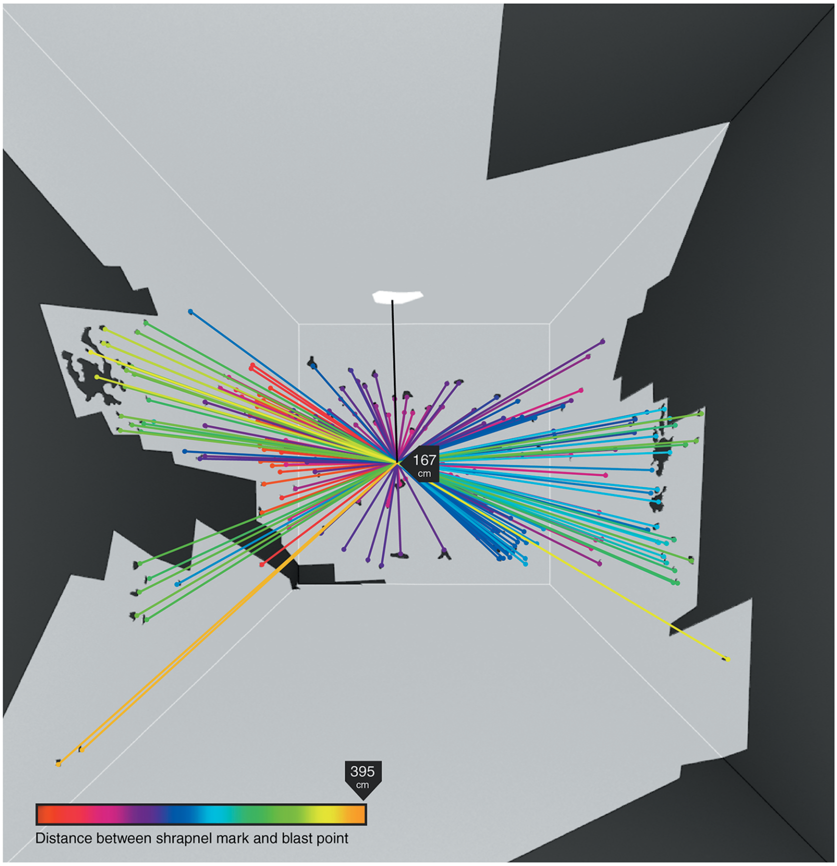

Figure 15.6: The trajectories of shrapnel pieces are plotted on a color scale by their distance from the point of explosion. (Forensic Architecture) © Forensic Architecture, 2021.

ery; computational models; all the countless mediation that swirl through the making-possible of this forensic testimony. An assemblage of nonhuman agents freezes this moment in time, the impossible split second within which the delay-fuse Hellfire II AGM-114R knocks on the roof and explodes into fragments. In this sense, "aesthetics does not exclusively refer to a property or capacity of humans" because "sensing is also found in material surfaces and substances, on which traces of impact or slower processes of change are registered, including in digital and computational sensors, which themselves detect, register and predict in multiple novel ways" (Fuller and Weizman 2021, 35). To be witness to what takes place at the threshold of detectability means bracketing the human sensorium in favor of an emergent, more-than-human aesthetics. The nonhuman lethality of the drone calls for nonhuman witnessing – even as they refuse to allow the human to escape responsibility.

Aesthetics, then, must be understood as constitutive of drone strikes and something that must in that context be accounted for in their witnessing. But it is also a critical modality for the witnessing of drone strikes, as attention to sensing and sense-making operates both to make legible the undetectable and as a technique of address to publics that might otherwise resist the making-political of the supposedly technocratic violence of drone strikes.

4 Conclusion

The deliberate opacity of drone warfare demands an approaching to witnessing that radically expands both the sites and events that must be witnessed *and* the entities and agencies that need to be understood as engaged in witnessing. Reckoning with the mutable and elusive nature of drone warfare requires greater attention to the lived experiences of the dead and the living, to the violent mediations that translate the complex textures of lives into computational systems for classifying and targeting, to the infrastructural scales at which drone warfare takes place and through which it can be witnessed, and understanding aesthetics as constitutive of drone warfare itself, as well as a critical means of witnessing its violence. Doing so exposes the limitations of an exclusively humanitarian framing for the witnessing of war. Expanding the ambit of witnessing technoscientific war is vital if such violence is to make an ethico-political claim upon publics and heighten the sense that such wars become owned and recognized and not purely technocratic matters, divorced from the polity at large. If the strike in Kabul provided a murderous coda to the inauguration of drone warfare over two decades in the Afghan skies, it also reminded us of the necessity of skepticism towards military claims, and the necessity of continuing to evolve the techniques, practices, and concepts that enable the witnessing of such violence. It may well be that doing so is one of the only paths left to renewing and intensifying the injunction that witnessing places upon distant publics to not simply note the existence of such war but reckon with their own participation in its brutalities.

Seminar Questions

1. What are the limitations of human eye-witnessing in the context of remote warfare?
2. How much weight should be given to nonhuman actors in any kind of witnessing assemblage?
3. The chapter brings together four ‘trajectories’ of witnessing: lived experience, violent mediation, infrastructural scale, and aesthetics. Are there other dynamics? If so, what are they and why do they matter?

4. To what extent might drones themselves becomes tools of witnessing war for news media, human rights organizations, or political activists?

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Part 3: **The Second Drone Age**

James Patton Rogers

16 What is 'The Second Drone Age'?

Abstract: Drones, once deemed by the US and its allies as a panacea to the perils of the Global War on Terror (GWOT), are now among the greatest threats to state security in the 2020s. While the "First Drone Age" was defined by the American and Western-allied monopoly over the use of Medium Altitude Long Endurance (MALE) drones, the Second Drone Age has marked the proliferation of remote-controlled, automated, and increasingly autonomous systems to both state and non-state actors. This chapter provides the editor's introduction to the Second Drone Age by highlighting the diverse array of actors, strategies, tactics, and technologies that have led to competition for command of the air above cities and battlefields alike. The chapter also highlights the topics covered by each expert author; topics that have been selected to illustrate the defining dynamics of this new era in drone warfare.

Keywords: Proliferation, weaponry, technology, strategy, airpower, terrorism: counterterrorism

War isn't getting any easier for nation-states. Russia's invasion of Ukraine and the Second Libyan Civil War; the war against ISIS and the fight for Nagorno-Karabakh; the Israel-Hamas war and the conflict in Yemen, each is an example of costly and prolonged conflict in the 2020s. Of course, war being deadly and difficult is nothing new and, in many ways, these modern wars are like any others in history. They are brutal, humans suffer, and the needless, senseless loss of life permeates to the core. There is, however, one specific common aspect to these wars that makes them like no other in history; this is that drones play a prominent, if not defining role, for both sides involved (Patton Rogers 2023).

Drones have been used before in war – as illustrated in section one of this handbook – but the fact that all parties to these conflicts in the 2020s – both state and non-state – utilize robotic drones as a powerful airpower component is a novel addition. To field a viable air force has traditionally been a difficult affair; even for medium-powered states. Pilots take a long time to train and are an expensive asset to maintain/replace. Aircraft are not cheap and take a high level of expertise and resources to fix, store, and launch. Communications, long-range information transmission, and air traffic control require sustained research and development and infrastructure investment to maintain (Shafer 2008). It is for these reasons that smaller state and non-state actors have, until now, been far less likely to deploy a viable and impactful airpower capacity in conflict. In the case of medium powers that already had some limited airpower, the drone has bolstered stockpiles through easier and quicker-to-acquire weapons and simpler-to-use systems (Suyatin-Colella and Demiryol 2023). As we have seen in the case of Ukraine, it is this enhanced drone capacity that has allowed a na-

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tion to fight for its existence against a much more powerful state and to maintain a sustained and long-range airpower component, striking deep into the heart of Russia. Not only this, but through the adoption and innovation of commercial-off-the-shelf (COTs) drones, Ukraine has also been able to continue its struggle for tactical air superiority on the battlefield against Russian forces who deploy similar weapons (Rogers 2023).

1 Ukraine and Beyond

There can be little doubt that it was Russia's offensive war against Ukraine that brought the global proliferation of drones to international eyes, dominating headlines around the world. While Turkish-supplied Bayraktar TB2 drones defined the opening blows of the war, powerful US-supplied Switchblade loitering munitions and commercially sourced quadcopter and First Person View (FPV) drones made their impact known on the battlefield (Chávez and Swed 2023). Not only this but the bolstering of Ukraine's war-making capacity has led to a surge in locally produced long-range "suicide drones," like the UJ 22, that has defined Ukraine's ability to respond to Russia's established long-range and tactical airpower capacity, which is also reliant on a vast array of different drones (Kunertova 2023). In terms of Russia, some of their drone systems have long been a part of the Russian war machine – such as the Orlan-10 – yet others, like the LANCETs and the Shaheds, are loitering munitions that have been rapidly adapted for the challenges of this specific war or acquired externally to increase long-range Russian firepower. In this section of the handbook, Samual Bendett (Chapter 20) analyses the Russian use of military drones, exploring these established and emerging technologies that have been deployed against Ukraine. In terms of Ukraine's experience, Ash Rossiter and Brandon J. Cannon provide an eye-opening appraisal of drones in this conflict and further afield, by highlighting the extent to which drones have, or have not been "game-changing" weapons for the states that deploy them. In all, the analysis of Ukraine and Russia in the handbook highlights one considerable aspect of the Second Drone Age, how drones are used by states, against other states, to compel their enemies to do their will. Nevertheless, the Russia-Ukraine war is but one example of how drones are impacting wars around the world.

The Second Drone Age is, at one level, easily defined as the global proliferation of military and/or weaponized commercial drones to state and non-state actors (Farooq 2019). To put the scale of this proliferation into perspective, as of 2022 there were 113 states and at least 65 violent non-state groups with access to weaponized drone technologies (Rogers 2022). Some weigh a few pounds and can travel tens of kilometers, others weigh a few tons and can fly over thousands of kilometers, all add a deadly airpower component that has altered the character of war to the point where all deployed personnel – be they from a super power or terrorist group – are vulnerable to

the very real threat of "death from above" (Gordon 2023). How this threat manifests in war, however, depends on the type of drone acquired and the strategies of air power adopted by the deploying actor. For instance, forms of drone deployment that defined the First Drone Age, such as the Targeted Killing of high-profile individuals, Time Sensitive Strikes, and the controversial practice of Signature Strikes will continue to dominate the wars fought by established and new drone actors alike. Yet, there are also new sets of practices in the wars of the Second Drones Age, enabled by new technologies and diverse military cultures, that present an ever-evolving challenge. In essence, while the practices of the First Drone Age will continue at a pace, adopted widely, the Second Drone Age will also see the rise of new drone actors that deploy innovative and deadly forms of drone warfare.

The term "Second Drone Age" was coined by investigative journalist and co-founder of AirWars, Chris Woods, to help explain, analyze, and even epitomize these broader trends in the global proliferation of drones. In fact, it was during discussions with Chris back in late 2019 and early 2020 that I decided to expand on his era-defining term, harnessing it as an analytical lens through which the field could begin to track, assess, archive, and investigate the exponential increase in drone use that was emerging globally. Aided by colleagues, I began to investigate the full scale of this new age in drone warfare and to identify the myriad ways in which the drone was impacting the practice of modern warfare.[1] In many ways, this handbook is a product of those early discussions with Chris, and the work I subsequently conducted with the United Nations and NATO, to appraise the true scale of this phenomenon. Each author in this section of the handbook, and in the final section on future trends and concerns, has devoted their intellectual efforts to helping in this task and as a result provide us with a varied, and revealing, collection of cases that cast light on the new practices, actors, dynamics, and the threats of the Second Drone Age.

Chapter 17 kickstarts this analysis by offering a detailed assessment of The Islamic State (IS) drone program. Emil Archambault and Yannick Veilleux-Lepage have tracked the IS development and deployment of drones since the terrorist group made its impact on the world stage by declaring the establishment of a Caliphate in 2014. As such, the authors detail what is arguably at least one of the starting points of the Second Drone Age, that pivotal period during the mid-2010s when a terrorist group was able to boost its military and propaganda power through the deployment of drones. Today, the legacies of the IS drone program can still be seen across the African continent as drone technologies and know-how have spread to other violent non-state actors who use drones for intelligence, surveillance, target acquisition, kinetic strike, and reconnaissance purposes. In Chapter 18, Olayinka Ajala expands upon this topic by outlining how

1 Thanks to Caroline Kennedy-Pipe and Agnes Callamard in the first instance, and Dan Gettinger, Kerry Chávez, and Ori Swed in the second instance, for their support in providing key data and conceptional framing.

drones have impacted state counterterrorism practices and the ongoing non-state conflicts in West Africa and the Sahel. As a region caught at an insecurity cross-roads, Ajala's analysis of the ongoing dynamics casts light on an often-neglected aspect of the current drone world. In addition, Kerry Chávez and Ori Swed add to this analysis in Chapter 22 by highlighting the broader scale of this non-state proliferation, explaining that in addition to terrorist groups, insurgents, rebels, cartels, criminal syndicates, and extremists also deploy drones to further their political or criminal ends around the world.

Indeed, the Second Drone Age is a truly international phenomenon, with most regions of the globe impacted by drone proliferation. Two of the main actors responsible for this drone proliferation are China and Türkiye (formerly Turkey). As Lucas Fiala, an expert in China's defense industry, explains, it is the Chinese development and sale of drones which is a key part of its policy of "drone diplomacy," allowing access to Chinese drones to act as a key perk of being a Chinese ally and joining China's Belt and Road trade and infrastructure initiative. In terms of Türkiye, the purpose of their reliance on, and sale of, drones is multi-faceted. As Rossiter and Cannon explain in their chapter (23), for Türkiye drones are a key part of growing its international prestige through regional power projection and the support of key allies. Yet, these drones, most prominently made by Baykar Technology (Türkiye's leading UAV and AI Company), are also a source of economic gain, with the seeming success of its technologies in Ethiopia, Libya, Nagorno-Karabakh, and Ukraine leading to record drone sales globally (Turak 2023). Yet, the manufacture, deployment and sale of drones has not been easy for all nations that have been drawn in by the allure of these uncrewed aerial systems. As Kunertova outlines in Chapter 21, European countries have been having immense problems with developing their own advanced drones in the past 20 years. Of interest for those focused on the dynamics of the War in Ukraine, however, Kunertova also explains how NATO and the EU help countries overcome the challenges posed by advanced military drones – albeit with mixed results.

To close the handbook, we look to the future and cast an investigative eye toward what concerns, challenges, and opportunities may define a "Third Drone Age." (Rogers, 2022) From Anna Jackman's eye-opening assessment of how drones will transform (but also threaten) the smart cities of the future in Chapter 24, through to J. Wesley Hutto's theoretically driven visions of future drone proliferation, this section of the handbook outlines some of the most prominent challenges that will emerge over the next 20 years as drones grow in power and presence. With this future in mind, Agnes Callamard and Carolyn Horn's chapter (29) on drones as a unique challenge to International Law explains how the next generation of ever more autonomous drones will transform war from being human against human to, machine against human, and machine against machine, with humans being targeted and killed based on algorithms without real-time human oversight. In addition, Zachary Kallenborn, Ingvild Bode, and Anna Nadibaidze add to this analysis of a disquieting future by diving deep into the technical capabilities of emerging and future drone technologies. Bode and Nadibaidze (Chapter 25)

and Kallenborn (Chapter 26) focus on Autonomous Drones and Swarming Drones in turn, explaining how advances in drone hardware and software (especially in terms of artificial intelligence) have been inspiring ongoing debates about the application of AI-based technologies to increase the level of drone autonomy, but also the scale of drone deployment. As an antidote to this, in Chapter 27 Andre Haider provides us with a proposal for how to comprehensively protect against the current and future drone threat through legislative, governmental, law enforcement, and military measures. Yet as final point of assessment and to help bring the handbook to a close, Michael P. Kreuzer provides us with a much-needed stock-take, placing the entire volume into its appropriate historical context. Indeed, what Kreuzer offers is a pertinent Ten-Year Review of global drone diffusion, the impact it has had on military strategy and effectiveness, and an assessment of what this continued diffusion to state and non-state actors will mean for future peace and security.

Overall, therefore, the final two sections of this handbook have the ambitious goal of trying to explain a world that is not only continuing to unfold before us, but also a future world where new technologies make a yet uncertain impact on the world. Such a task is far from easy, but a vital one to undertake. No weapon has remained for very long as the sole preserve of the nation that invented it. No matter the restrictions in place, all weapons proliferate. From the crossbow to the bomb, even the most closely guarded state weapons have spread around the world and often end up threatening the nation that first invented them. As such, it is highly likely that, in addition to the current generation of drones proliferating around the world in an unchecked and uncontrollable manner, the next generation of drones will proliferate at an equal or greater pace. When AI-infused autonomous systems are considered, this presents us with a future world where humans may no longer be in the loop of control when it comes to deciding whether or not a human lives or dies. As such, it is the chapters in these final sections of the handbook that I hope will provide a warning about our impending future. It is through such a warning that we can bolster a broader understanding of the challenges faced, encourage additional research into how to solve them, and boost international efforts to implement arms control measures that will keep warfare firmly under the cognitive and physical control of human beings. To fail in this task would risk the future of our humanity.

Seminar Questions

1. What is the second drone age and how does it differ from the first?
2. How has the global proliferation of drone technologies impacted international security?
3. What three technological innovations may define the third drone age?
4. In groups decide on what features you think will define the third drone age?

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Emil Archambault and Yannick Veilleux-Lepage

17 The Islamic State Drone Program

Abstract: This chapter provides a survey of IS's drone program, how it came to embody this most salient menace, and how IS innovated in its use of drones. To this end, we outline how IS built structures to centralize drone development and modification, as well as how they used them for attacks, to film and direct other operations, and for reconnaissance. Finally, we argue that IS's innovation lay mainly in its use of drones for propaganda, rather than in the oft-cited threats of terrorist attacks or weapons of mass destruction deployment. The first part of this chapter presents how IS built a highly centralized drone program with established structures for training, acquisition, and modification. The second section analyses IS's different use of drones and how the group used drones for offensive operations and to command and control other types of attacks, notably artillery and vehicle-borne improvised explosive devices. The third section argues that IS employed drone imagery in propaganda to further its claim to effective sovereignty and control of its territory. The final two sections analyze the importance of the IS drone program for wider studies, notably of the threat of dissemination of knowledge about non-state drone use. Ultimately, we argue, the IS drone program represents one of many pathways of non-state drone development.

Keywords: Non-state actors, terrorist groups, Islamic State, visual propaganda, terrorist innovation, sovereignty

1 Introduction

The Islamic State in Iraq and Syria (IS) distinguished itself among others terrorist groups through its extensive use of drones in every facet of its operations, militarily as well as politically. While the Islamic State was neither the first violent non-state group to employ drones, nor the first non-state group to kill using drones,[1] it distinguished itself by the scope of its use, as well as its significant innovations in how it used drones. As it conquered significant swathes of territory in Iraq and Syria, laid claim to a 'Caliphate,' and established varied administrative structures, IS developed an extensive drone armament program which caused considerable difficulties to the Kurdish and Coalition forces combating it, all without the presence of a state patron. IS's simultaneous involvement in terrorist attacks in Western countries far from its territorial bases, combined with its tentative forays into developing chemical weap-

1 See the chapters by Chávez and Swed, as well as Rossiter and Cannon in this volume, as well as (Veilleux-Lepage and Archambault 2022).

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ons, crystallized urgent concerns about the threat of weaponized drones in ways that previous non-state groups had not manifested.

While IS's drone program was ultimately short-lived – its most active phase took place from September 2016 to February 2018 – it came to represent a major threat to state operations. Military leaders such as United States Special Forces Command's General Raymond Thomas declared that the Coalition against IS's "most daunting problem was an adaptive enemy who, for a time, enjoyed tactical superiority in the airspace under our conventional air superiority in the form of commercially available drones and fuel-expedient weapons systems" (Larter 2017). This present chapter provides a survey of IS's drone program, how it came to embody this most salient menace, and how IS innovated in its use of drones. To this end, we outline how IS built structures to centralize drone development and modification, as well as how they used them for attacks, to film and direct other operations, and for reconnaissance. Finally, we argue that IS's innovation lay mainly in its use of drones for propaganda, rather than in the oft-cited threats of terrorist attacks or weapons of mass destruction deployment.

2 The Islamic State's Drone Program

Unlike other non-state groups which have used drones extensively such as Hezbollah or the Yemeni Houthi forces, IS built up its drone program without the benefit of a state patron which could supply it with technological and logistical help. The group, therefore, demonstrated significant innovation in acquiring, modifying, and equipping small commercial-off-the-shelf (COTS) drones. As with other facets of the group's operations, such as monetary regulation and propaganda production (Veilleux-Lepage 2019a; Lokmanoglu 2021), IS established to this end an extensive array of training facilities, arsenals, and workshops. Almohammad and Speckhard, among others, sought to trace these networks, identifying four distinct centers where IS would equip drones and train operators (Conflict Armament Research 2016, 2020; Almohammad and Speckhard 2017). IS's armament production, in many respects, resembled a "sophisticated production chain" allowing the group to manufacture and disseminate standardized equipment throughout its forces (Conflict Armament Research 2016).

These logistical structures served to train personnel before operations (Warrick 2017), as well as preparing equipment based on supplies from abroad. While IS largely manufactured its own explosives – particularly variants of a multi-purpose grenade which could be used by ground fighters as well as dropped by drones (Conflict Armament Research 2017; Waters 2017) – it relied largely on modifying commercial drones it obtained from abroad. For this, it relied on extensive supply chains sprawling across other countries, and often procured centrally (Rassler 2018; Heubl 2021). Don Rassler, Muhammad Al-Ubaydi, and Vera Mironova, for instance, obtained scores of

reports, purchase orders, and receipts for the purchase of drones (Rassler, Al-Ubaydi, and Mironova 2017), establishing the strong centralization and careful planning of the group's drone infrastructure, which allowed it to achieve drone operations on a significant scale, as well as integration with the wider parts of the IS arsenal.

While IS did experiment with building its own drones, notably by developing some basic pulse jet engines (Conflict Armament Research 2020), it overwhelmingly employed commercial drones which it modified for its purposes. Models from the DJI brand proved particularly popular, notably due to the use of acquisition and employment (Heubl 2021). Except in rare instances, IS preferred these munition-dropping drones to alternatives, such as using the drones as loitering munitions piloted to their target. IS also sparingly employed drones which were booby-trapped to explode upon being discovered by enemy forces: in October 2016, for instance, a downed drone exploded when recuperated, killing two Kurdish Peshmerga forces and injuring two French soldiers (Schmidt and Schmitt 2016).

3 The Islamic State's Use of Drones

Islamic State achieved a tight integration of its drone operations within its broader military and political machines.[2] As we explain below, the threat of the group's drones did not lie exclusively in its use of aerial bombardment, but in the combination of drone attacks with other aspects of its military and propaganda operations. As such, it would be a mistake to concentrate only on the weaponized use of drones by IS – the role of drones in every facet of the group's operations must be appreciated (For a typology of non-state drone use see Rassler 2016; Veilleux-Lepage and Archambault 2022).

3.1 Conducting Drone Strikes

IS employed modified COTS drones extensively to drop munitions on enemy targets. These modifications were often fairly light, consisting mainly of attaching an improvised grenade release mechanism to an existing drone. These grenades, despite showing regional variations (Waters 2017), were easily disseminated by the group and often cheap, fairly weak, and easy to manipulate, though later iterations contained more powerful explosives. Most often, it aimed at unprotected, fairly low-level targets, rather than high-profile nodes or well-defended positions, though on some occasions

2 The contents of this section rely largely on two previous publications by the authors (Archambault and Veilleux-Lepage 2020; Veilleux-Lepage and Archambault 2022). In these two works, we analyzed both a sample of 524 images of IS propaganda depicting drone activity and a systematic collection of media reports concerning IS drone activity.

heavier munitions were used to attack armored vehicles (Conflict Armament Research 2017, 2; Waters 2017). By and large, IS employed its drones as part of tactical combat operations, rather than to achieve strategic or deep attacks. Nevertheless, on occasion, the group highlighted its ability to hit major targets, notably an ammunition depot in a stadium in Deir-Ez-Zor in Syria, in March 2017 (Yahoo!News 2017). While such attacks may have had a limited tactical impact, the use of drones as flying artillery remained rather incidental in its effects on the conflict.

Due to the nature of the warfare in 2017 – the year when IS drone use peaked – a large portion of the group's drone use occurred in urban areas (Almohammad and Speckhard 2017). In urban settings – in Mosul and in Raqqa – IS sought to exploit its ability to fly a large number of drones at once, as well as creating confusion among enemy forces. Raymond Thomas, quoted earlier, reported that on one instance IS flew over 70 drones in a single 24-hour span in Mosul, severely disrupting Coalition operations (Larter 2017). On other occasions, the difficulty of distinguishing small drones operated by IS from those operated by Kurdish Peshmerga allowed IS to exploit difficulties in planning and executing operations (Gibbons-Neff 2017).

3.2 Conducting Reconnaissance, Command, and Control

A second use for drones by IS lies in their visual capabilities. Beyond being used for offensive purposes, IS's drones allowed it to gain in situational awareness, plan and direct attacks, and target artillery fire. In one of the first instances of IS drones being used to facilitate other types of attacks and actions on the battlefield, in March 2016, American forces reported a drone overflight of a base outside Makhmur, in Iraq; a few days later, a highly precise rocket strike hit the base, killing one Marine, leading to suspicions IS used drones to direct artillery strikes (Tadjdeh 2014; Schehl 2016; Chávez and Swed 2020, 33).

In urban settings, IS has used drones among others to command and direct attacks by vehicle-borne improvised explosive devices (VBIED), thereby enabling more complex and coordinated offensive operations (George and Hinnant 2017; Rassler 2018, 3). Raymond Thomas's comment above – that IS achieved "tactical air superiority" underneath American air power, thus reveals a major aspect of IS's drone use: the group could, through small, low-flying drones, achieve limited situational awareness which allowed it to engage in coordinated attacks. In particular, such command and control allowed IS to evade roadblocks and Coalition defensive positions in urban battles, notably in Mosul (Balkan 2017, 26–30). The threat of non-state drones, thus, arises not only from their offensive capabilities, but from how IS used them to augment the range and value of their other forces and capabilities. In this case, the command and control of VBIEDs was combined with a strong propaganda aspect: the images of these paths and attacks were routinely compiled into photo packages show-

ing perpetrators from martyrdom video to final detonation, which were then released by IS's media organs (Archambault and Veilleux-Lepage 2020, 967).

4 Drone Propaganda: Flying Like a State

Arguably, the most distinctive and innovative aspect of IS's drone use lies in the propaganda employment of drone imagery. As is extensively documented elsewhere, IS expended tremendous energy in curating its 'brand' and presenting itself as a credible, state-like actor (Veilleux-Lepage 2016b; Winter 2018). This took the form of large volumes of propaganda imagery disseminated from centralized media organizations through online outlets, magazines, and social media networks of loosely-affiliated sympathizers (Veilleux-Lepage 2016a, 2019; Kaczkowski 2019). IS carefully curated its visual branding, producing imagery which furthered its image as a sovereign 'Caliphate,' a sovereign state (Jacoby 2023; Winter 2022). Among others, IS thus put out images of the fulfilling of basic administrative functions, such as coinage (Lokmanoglu 2021); these seemingly mundane everyday images coexisted along highly violent imagery of massacres, executions, and military actions (Friis 2015; Mabon 2017). In drone imagery, these two strands coincided, using military capabilities to visually demonstrate IS's ability to act like a sovereign state.

IS's visual propaganda output comprised three main types of images by drones:[3] (1) photo series of munition drops by drones; (2) images of VBIED and other attacks taken by drones; (3) images of drones overflying terrain with no specific activity occurring. IS's output of images of drone activity is not incidental, but rather part of a heavily curated propaganda effort contributing to its 'brand.' In this context, drones allow the group to exploit an aerial perspective it cannot otherwise access, thereby laying a claim to the effective control of territory and airspace through overflying. In other words, IS visualizes its claim to the sovereign control of territory, furthering its aim of presenting itself like a state.

Scholarship in political geography has long highlighted the 'process' of producing territory, not merely as fixed lines but as conceptual realities which are constructed and enacted through performative actions (Williams 2011, 259; Elden 2013, 36). Visual representations, linguistic metaphors, and performative discourses represent power relations, making concrete claims of control and power. Roger Stahl, drawing on Donna Haraway, discusses the 'god trick' of drone vision and representation, while Antoine Bousquet traces the association of targeting and vision in a 'martial gaze': in both cases, the emphasis is on the representation of power inherent in overflying and

3 Our research was based on a sample of 524 images of drones (out of a larger dataset of 19,749 images) published by IS between October 9, 2016 and December 30, 2018 (Archambault and Veilleux-Lepage 2020, 964). Nick Waters has compiled a similar dataset (Waters n.d.).

seeing from above (Stahl 2013, 664; Bousquet 2018; Grayson and Mawdsley 2019). By showing itself able to fly over territory with impunity, capturing it from the air, IS exploits the association of flying with sovereignty, visually rendering its 'caliphate' through the use of drones (Williams 2007; Munro 2014).

The contestation of air superiority described by Raymond Thomas, therefore, is not only one which takes place in tactical terms: it is a conceptual and visual struggle, where IS uses drone imagery in propaganda to puncture Coalition claims to controlling territory. Where other groups such as Hezbollah privilege long-range drone flights to demonstrate vulnerability from the air and challenge the territorial integrity of its adversaries (see also Kahn 2013; Hoenig 2014; Al-Aloosy 2022), IS sought to do so through the diffusion of images of routine flights which showed it not merely fighting for its territory, but controlling its airspace, like a state.

5 Wider Implications

Two further implications for the further study of drone warfare merit consideration. The first concerns what IS did *not* do, namely use drones to launch weapons of mass destruction or to conduct terrorist attacks away from the Middle East. While IS did have a chemical weapons program which was active concurrently with its development of drones (Rassler 2018, 21–22; Gartenstein-Ross, Shear and Jones 2019, 47), there is no evidence that the group ever attempted seriously to mount WMD dispersal equipment onto drones and use them in combat. Similarly, there existed extensive fear that IS might use drones to mount terrorist attacks in Western countries. Several other techniques traveled through to the group's sympathizers abroad, notably vehicle ramming and other mass killing techniques (Miller and Hayward 2019; Veilleux-Lepage 2019b), IS regularly put out advice and information on how to conduct terrorist attacks abroad, including by drone (Veilleux-Lepage, Daymon, and Archambault 2022, 20). Unlike vehicle ramming, however, there is no evidence of any such attempted attacks by drones abroad. While the COTS drones themselves would be easily available anywhere, conducting terrorist drone attacks away from IS's territorial base would have required sufficient technical knowledge for modification and operation without access to IS's structures, which may have contributed to the lack of such plots. Overall, while IS mounted an innovative drone program, scholars and observers must be careful not to overstate the potential threats it presented.

The second implication lies in the dissemination of knowledge about drone activities to ideologically opposed movements in the West, such as right-wing extremists. It is well documented that right-wing extremist movements had access to IS's technical information which the group published online in the hopes of spurring terror attacks abroad. Yet, while right-wing actors had access to similar equipment, technical data, and sometimes extensive resources, they failed to replicate IS's use of drones for of-

fensive operations (Veilleux-Lepage, Daymon, and Archambault 2022). This lack of transmission further highlights key characteristics of IS's drone program. The group not only possessed the technical capacities, territory, resources, and supply chains to mount an integrated program. It furthermore found itself in a tactical, strategic, and political situation where such use was seen as productive, and where drones could benefit them militarily and politically, in ways that could not be replicated by other systems. The IS case instructs us that drone programs are not always easily replicable, and that not all groups will use drones in similar ways, for similar purposes. Aspects of IS's drone programs – its infrastructure, its tactical uses, its propaganda purpose – may reoccur in other groups; nevertheless, IS's drone program did not turn the tide in its military operations, and it does not provide a single development pathway for the non-state use and development of drone capabilities.

6 Conclusion

This chapter has provided a survey of how Islamic State built up a drone program and employed its drones. In several ways, the drone program of the Islamic State differed from that of other non-state groups. In yet other ways, it mirrored that of states on a smaller scale. In the short year and a half during which IS drone activity was at its peak, it succeeded in achieving a high volume of activity and a high rate of innovation despite the absence of a state patron. The group implemented a highly centralized structure for acquisition, modification of equipment, and training. IS, further, used drones both for munition drops on their own, as a form of tactical air power, and in combination with other weapons systems, notably VBIEDs. In urban battles, it employed drones in large numbers to disrupt enemy operations, gain situational awareness, and exercise command and control functions.

Beyond its military use of these weapons, however, IS distinguished itself by the tight integration of drones into its extensive propaganda machine. Drone images were routinely disseminated, furthering the group's aim of presenting itself both as a capable military force and as a credible 'caliphate' possessing the attributes and exercising the functions of a sovereign state. Drawing on well-established visual and conceptual associations between altitude, aerial vision, and sovereignty, IS exploited the view from above in its propaganda outputs to lay claim to controlling territory and airspace. This propaganda aspect of non-state drone use is so far unprecedented, and a major innovation by IS. While scholars of state drones and of its cultural aspects have long studied the visuality of drone warfare (Adey, Whitehead, and Williams 2013; Grayson and Mawdsley 2019; Borrebye Bjering and Graae 2020), to see this perspective replicated by a non-state group constitutes an advance which may be picked up by other actors – state and non-state – using drone imagery in political communications.

The extent to which IS's drone program constitutes a significant innovation remains therefore uncertain. On the one hand, the group did build up a drone infrastructure from scratch, without the support from a state patron. The group, additionally, innovated in the use of drone imagery for propaganda purposes, and its use of the vertical visual perspective for propaganda remains as of yet unmatched among non-state groups. Finally, the tactical threat of IS drones spurred significant tactical, organizational, and technological innovation by the United States military and others, to ensure they not find themselves in a situation where their "only available response was small arms fire" (Larter 2017). Conversely, the group's drone program existed for a very short period of time, and apart from certain facilities which the Kurdish PKK may have repurposed (Balkan 2019), left no lasting structures or organizations. The group's drones, additionally, had no visible effect on the strategic situation other than slowing down enemy advances. Other non-state groups such as Houthi forces in Yemen or Hezbollah have established drone programs which have existed for longer periods of time, and which have arguably demonstrated more significant results (Veilleux-Lepage and Archambault 2022). The IS drone program, as such, is not a "roadmap" (Rassler 2018, 1) which other groups will follow, but one of many examples of how non-state groups can build drone infrastructure, use drones in combat, and employ drones to advance political claims.

Seminar Questions

1. How important were drones to IS militarily? And in propaganda?
2. Are other groups likely to copy or follow IS's example in using drones? Why or why not?
3. How can security forces mitigate this threat? Why did the IS drone program end?
4. How is the IS case different from other drone programs discussed in this book?
5. Based on this case, how worried should we be about the risk of WMD, or terrorist attacks using drones? Why or why not?

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Olayinka Ajala

18 The Use of Drones in West Africa and the Sahel

Abstract: There has been a proliferation of drones in Africa in the last few decades. Ranging from nation-states deploying them to counter insurgencies in East Africa and in counter-terrorism drives in West Africa and the Sahel, drones have become increasingly used for surveillance, reconnaissance, and attacks. While the technology is becoming increasingly available, affordable, and easier to use, this chapter argues that the lack of accountability and opaque use of the technology poses a challenge to its effective use. The chapter analyses the rise in the use of drones by state and non-state actors and argues that the lack of regulation and opaque use of drones pose a threat to the security and stability of many countries in West Africa and the Sahel. The secretive operation of drones and the lack of accountability could also encourage more non-state actors to adopt the technology, further weakening the security architecture of many countries in Africa. The chapter concludes that while drones offer a cheaper and effective counter-terrorism mechanism, high proliferation and lack of regulation might limit the potentials of this technology.

Keywords: West Africa, Sahel, counter-terrorism, surveillance, Boko Haram

1 Introduction

In the last few decades, the use of drones has been on the increase in West Africa and the Sahel. This chapter discusses the challenges to the proliferation of drones using a case study of West Africa and the Sahel. In the last few decades, the region has been plagued with several forms of insecurity, such as trafficking (human, arms, and drugs), insurgencies, and terrorism. In order to address these challenges, the countries in this region have formed bilateral and multilateral organizations and have employed different tactics to maintain security and to secure lives and livelihoods in the region. More recently, there has been an increase in the use of technology to address these challenges, with use of drones at the forefront. While drones offer effective technology for surveillance and monitoring the activities of these groups, the opaque nature of drone warfare coupled with the lack of accountability is concerning. This opaque nature of drone warfare is also being exploited by insurgent groups operating in the region. The chapter argues that while drones could be an effective and efficient technology to achieve security in the region, its lack of regulation is likely to become an issue that would impact on its use resulting in human right abuses and further weakening the security architecture of the region.

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2 Drone Deployment in West Africa and the Sahel

Since the turn of the new century, terrorism has been a major issue destabilizing West Africa and the Sahel with groups such as Boko Haram, Al Qaeda in the Islamic Maghreb, Islamic State in the Greater Sahara, among others, destabilizing the region. In response, the countries in the region have formed several multilateral organizations, such as the G5 Sahel – formed in 2015 to tackle insecurity in the Sahel and consisting of five Sahel countries: Burkina Faso, Chad, Mali, Mauritania, and Niger – as well as the Multinational Joint Task Force (MNJTF). The MNJTF is a multinational military force comprising military detachments from Nigeria, Niger, Chad, Cameroon, and Republic of Benin, with a primary mandate of combating Boko Haram (Ajala 2021). In combating the terrorist threats as well as tackling multiple other dangers facing the region, most of the countries have utilized several weapons, including drones for almost two decades.

The first recorded use of drones in the region was by Nigeria in 2006. After an increased number of attacks by Boko Haram in the northeastern part of the country, the Nigerian military purchased nine Aerostar drones from Aeronautics Defense Systems (ADS), an Israeli company, together with several unmanned patrol boats for the navy at a cost of $260m (Nkala 2014). The drones were deployed for surveillance and patrol first in the Niger Delta region following unrest and later to gather intelligence on Boko Haram in the northeastern part of the country. In 2008, French military forces supporting the former president of Chad deployed 11 CL-289 drones to gather intelligence and monitor the movement of rebels after they entered the capital of Chad to remove the president (Kurpershoek, Valdez, and Zwijnenburg 2021). Other countries in West Africa – such as Mali, Niger, Cameroon, and Mauritania – have also deployed drones at some point, either directly through individual militaries or in conjunction with allied partners, especially the United States or France.

While drones have mostly been used for surveillance and reconnaissance, there have also been reported use of combat drones in the region. Since 2012, Mali has been battling an insurgency which eventually culminated in the country seeking external support. Being a former colony of France, the French government deployed troops in the country and used drones to carry out surveillance and execute attacks against Islamist militants. In 2019, the French military reported that they carried out a drone strike in Mali in which 40 alleged insurgents were killed (The Guardian 2019). There have also been other reports of drone attacks by French troops in Mali. Niger is another country in the region that has deployed drones in several ways. Before Majamadou Issofou took office as Nigerien president in 2011, the country was plagued with instability with coup d'états in 1996, 1999, and 2010. Issofou, on assumption of office, was determined to tackle terrorism, irregular migration, and other forms of insecurity and insurgency in the country. To achieve these objectives, the president formed a strong military alliance with France and the United States, especially to combat terrorism. Moore and Walker describe the alignment of French and American military

not only in Niger but across West Africa and the Sahel as a form of "cohabitation" whereby both countries either build or share military facilities (Moore and Walker 2016). In 2013, France and the US built drone facilities at Niamey and both carried out drone operations from N'Djamena international airport in Niamey.

Subsequently, the US built its largest drone base in Africa in Agadez, Republic of Niger. Ajala (2018b) stated that despite the large number of US bases across Africa, the air capabilities of the US military remained weak as it had to share facilities with other countries like France. This factor coupled with the US's determination to increase its presence in the Sahel region resulted in the construction of the drone base in Agadez. The drone base, which was completed in 2019, is now fully operational and has been carrying out intelligence, surveillance, target acquisition, and reconnaissance (ISTAR) flights across the Sahel (VOA News 2019). Although the US has not reported any attacks carried out with the use of drones in the region, it is difficult to understand or verify the US's use of drones in the region. Niger is an important ally of many countries, such as France, the United States, China, and several other countries in the European Union. The country's size and strategic location makes it a bastion of drone activities with ISTAR flights carried out from the country to cover most of the countries in North Africa, West Africa, and the Sahel (Rogers and Goxho 2023). The US military and the CIA for instance have a presence in Niger where they operate drones and provide security assistance to countries in the region (Rogers and Goxho 2023). Niger has also been able to use this unique relationship as leverage when dealing with the 'great powers' (Rogers 2021). Apart from the major international players (France and the US) in the region, other countries such as the Netherlands, Sweden, Germany and Italy have all deployed drones (mostly unarmed) for either bilateral intelligence, surveillance, and reconnaissance (ISR) operations or as part of United Nations operations in the region (Kurpershoek, Valdez, and Zwijnenburg 2021).

3 Opaque Warfare: Drone Deployment in West Africa and the Sahel

One key reason why drones have been the weapon of choice in West Africa and the Sahel is the opaque nature of the technology and the lack of responsibility the weapon offers. Contrary to developed nations' practice of linking human rights to the sale of weapons and the act of monitoring how these weapons are used, drones are sold by several nations without any demand for accountability or usage (see Table 18.1). For instance, Iran and Turkey are some of the key players in drone technology and neither nation demands information on how its products are used. In addition, drones are often deployed in areas of low reporting, which makes accountability another major issue. The opaqueness of drones is not limited to the region and has been a major source of criticism for decades, especially since the way drones were used by the United

Table 18.1: Drone use by state/non-state actors in West Africa and the Sahel*.

State/Group	Key Partners	Drone Deployment	Year of First Usage
Nigeria	USA Israel United Kingdom France	ISTAR	2006
Burkina Faso	USA	ISTAR, ISR	2007
Mauritania	USA China France	ISR	2007
Chad	France	ISTAR, ISR	2008
United Nations	Most countries	ISR	2009
Niger	USA France Denmark Turkey Germany	ISTAR	2011
Mali	France USA United Nations	ISTAR, ISR	2013
Cameroon	USA France	ISR	2013
Islamic State in the Greater Sahel		ISR	2015
Islamic State West African Province		ISR	2018
Boko Haram		ISR	2018
al-Qaida in Islamic Maghreb (AQIM)		ISR	2018
Jama'at Nusrat al-Islam wal Muslimeen		ISR	2018

ISTAR – Intelligence, Surveillance, Target Acquisition and Reconnaissance
ISR – Intelligence, Surveillance, and Reconnaissance
*The countries in this table represent those that have made considerable use of drones to tackle insecurity and for counter-terrorism purposes. Almost all the countries in the regions use drones in some ways.

States and their allies in Iraq, Yemen, Pakistan, Somalia, and Afghanistan (Ajala 2018b). Drones and accountability are two words not often seen together in the same sentence as far as modern warfare is concerned. The "problem of secrecy" in the use of drones, especially by developed countries such as the US, was illustrated by Milena Sterio (2015, 132). Sterio stated that the United States currently operates two separate drone programs, which are the overt and covert programs. While the overt program is conducted

by the Pentagon and the Joint Special Operations Command (JSOC) and publicly acknowledged, the covert program is conducted by the CIA and remains top secret (Sterio 2015). The author argued that despite accountability concerns expressed by several international organizations such as the United Nations Human Right Council (UNHRC) and the United Nations Special Rapporteurs on Counter-Terrorism in 2014, the CIA drone program remains embedded in secrecy and continues to be used in Pakistan, Somalia, and Yemen. Although the US have not reported any drone attack in West Africa and the Sahel, their activities in the region, especially around the drone base in Agadez, remains secretive. According to Djibril Abarchi, the chairman of the Nigerian Association for the Defence of Human Rights, "we just know there are drones; we don't know what they are doing exactly. Nothing is visible. There is no transparency in our country with military questions. No one can tell you what's going on" (Whitlock 2013).

France, another major country that has deployed drones in West Africa and the Sahel also operates in secrecy in the areas of drone warfare difficult or sometimes impossible to navigate. France first deployed drones in the Sahel in 2008, which was to support EU operations in Chad (Asencio, Gros, and Patry 2010). Since 2013, France has been involved in several military operations in Mali, especially operation Servel, which was designed to prevent Islamist insurgents from advancing southwards in the country. The operation was launched after the insurgents had taken over large areas of land in the northern part of the country (Boeke and Schuurman 2015). In operation Serval, the French deployed class 1 drones such as French Survey Copters and Cassidian DRACS for reconnaissance and to gather intelligence around the areas of operations. Despite the French military describing drones as a unique tool that is essential for modern operations (Ministère de la Défense 2013), their use of drones in Mali and across the Sahel remains opaque. This is because since 2019, France has carried out multiple strikes and killed several terrorists in Mali and Burkina Faso, but it is difficult to construct the identity of those killed in order to ascertain whether they are actual terrorists or insurgents, as these areas of operations are not easily accessible and there are no independent watchdogs in the areas. For instance, Ajala (2018b) argued that migrants in the region travel in convoys similar to those of terrorist groups and this poses a major problem for drone operations in terms of surveillance and intelligence gathering.

The increased use of drones by African countries, especially those fighting insurgency in the Sahel and West Africa, is further strengthened by the opaque nature of the technology and the lack of coherent and effective legislation on the use of drones. As stated earlier, most of these countries now deploy drone technology and the question is, in addition to the relatively cheaper costs of the technology, why is it becoming a weapon of choice? Many of the countries involved in the fight against insurgencies have been previously accused of gross human rights abuse. For instance, in 2015, a damning report by Amnesty International alleged that the Nigerian military extrajudicially executed more than 1,200 people with at least 7,000 others dying in military detention (Amnesty International 2015). This report, along with a 2014 US State Department

report on human rights in Nigeria, accused the Nigerian military of gross human rights violations, which led to the US suspending the sales of some types of weapons to the Nigerian military (Omotuyi and Okwechime 2021). In addition, Perouse de Montclos argues that the return to democratization in 1999 has not changed the military's impunity and human rights abuse. The author, while describing the actions of the Nigerian military, stated, "Corruption, impunity, a weak chain of command and lack of accountability, qualifications, training, recruitment, supplies, and control by civilian authorities explain their wrongdoings, together with the military dictatorships of the 1970s and 1980s and the war on terror since 2009" (Perouse de Montclos 2018, 110).

It is important to state that human rights abuses are not exclusive to the Nigerian military as other countries in the region – many of which now deploy drones – have also been accused of human rights abuses. For instance, members of the G5 Sahel Force have been implicated in carrying out extra-judicial killings and other human rights violations. The United Nations Multidimensional Integrated Stabilization Mission in Mali is a United Nations peacekeeping mission in Mali (MINUSMA). Its civilian casualty tracking unit shows that a third of the civilian casualties can be attributed to government forces, which is greater than the number of casualties caused by jihadist groups (Karlsrud and De Coning 2021). The situation is similar to that of the MNJTF operating around the Lake Chad Basin. Yakubu, Aideloje, and Babawale argue that the force over the years has carried out clandestine activities such as torture, extra-judicial killings, violence against women, and other human rights violations which, according to international humanitarian laws, could be regarded as 'war crimes' (Yakubu, Aideloje, and Babawale 2022). Drones in particular could be used indiscriminately without accountability, resulting in the deaths and maiming of civilians, as recently witnessed in countries such as Ethiopia (Zelalem and Jelan 2022)

Such human right abuses, lack of transparency in conducting counter-insurgency, and unrestricted and unregulated use of drones could be a recipe for disaster for the region. Considering the poor human rights records of the countries deploying drones in West Africa and the Sahel, continuous deployment, without the pressure of accountability, would only increase human rights abuses and increase the opaque nature of drone warfare. It is important to highlight that most of these countries operate along the border regions of each other and with increased use of drones, especially those resulting in civilian casualties, making countries liable for their actions and pressuring them to take responsibility becomes increasingly difficult. Major collateral damage arising from drone strikes risks being unaccounted for or resulting in a blame game. Kurpershoek, Valdez, and Zwijnenburg argue that "the absence of a clear legal position by African states and the African Union on the use of armed drones, in particular in counter-terrorism operations, is a worrisome development" (Kurpershoek, Valdez, and Zwijnenburg 2021, 5). In addition, another major consequence of this opaque warfare is the deployment of the technology by non-state actors, which is also a cause for concern in the region.

4 Drone Use by Non-State Actors

The proliferation of drones is not restricted to state actors. The first ever recorded use of a weaponized drone by non-state actors was by Hezbollah in 2006. The group rammed an Israeli warship with a drone fitted with explosives, causing extensive damage (Hendawi 2006). More recently, groups like Islamic state (ISIS) have used drones to attack targets (Reuters 2016). ISIS used drones to carry out surveillance and attack Iraqi troops in the northern city of Mosul. In 2020, the interior minister of Mozambique stated that terrorists in northern Mozambique have been deploying “sophisticated technologies,” including drones, to identify their targets in the country (IOL 2020). The use of drones by terrorist organizations, especially for surveillance purposes, is rapidly increasing in West Africa and the Sahel. The president of Nigeria stated that Boko Haram and Islamic State West Africa Province (ISWAP) are deploying drones for surveillance, resulting in a resurgence of attacks not only in Nigeria but also around the Lake Chad Basin region (AP News 2018).

The deployment of drones by groups such as Boko Haram, which is one of the largest terrorist groups in West Africa, is now a worrisome development as it makes counter-terrorism more difficult. This is because the technology allows them to evade attacks and launch counter-attacks. One key explanation for the ability of Boko Haram and its affiliates to access technology such as drones is the financial standing of the organization. While it is difficult to state clearly how much the organization generates, it is documented that illicit activities such as kidnapping for ransom, taxation of local communities, and taxes on commodities provide large financial capabilities to the organization. The infamous kidnap of a French family carried out by Boko Haram fighters in February 2013 laid bare how kidnapping has been a major source of revenue for terrorist groups. Tanguy Moulin-Fournier, his brother, wife, and four children were kidnapped near the Waza national park in Cameroon and were later released after a ransom of $3 million was paid to the terrorists, although France and Cameroon denied paying a ransom (BBC 2013). On March 28, 2022, a train carrying hundreds of passengers from Abuja (the capital of Nigeria) to Kaduna (another state in northern Nigeria) was attacked by terrorists who eventually abducted hundreds of passengers. The terrorists demanded 4.3 billion naira (about $10 million) to release the kidnapped victims, having collected 800 million naira (about $2 million) from seven of the victims released in July 2022 (Vanguard 2022).

In addition to kidnapping for ransom, terrorist groups such as Boko Haram and ISWAP generate a lot of resources from local taxation. A detailed analysis of terrorist financing around the Lake Chad Basin area by HumAngle media explain how international trade in smoked fish and red pepper contribute to the revenue of Boko Haram and its affiliates. The insurgency ravaging the Lake Chad region resulted in a mass displacement of farmers and fishermen from the region. The activities of Boko Haram and the resulting counter-terrorism endeavors paralyzed farming and fishing in the region. This, however, changed in 2015 when the insurgents took steps to reverse the

trend of displacement. The leadership of ISWAP (a breakaway faction of Boko Haram) visited internally displaced persons (IDPs) camps and encouraged the farmers and fishermen to return to work, promising full protection. The action of ISWAP to protect the workers and create 'safe corridors' for the transportation of red pepper and smoked fish has been hugely successful and has allowed the insurgents to establish themselves around the Lake Chad Basin axis. The protection offered to the farmers also came at a cost as the farmers and fishermen paid taxes for every bag of fish or red pepper produced or transported around the region (Salkida 2020). These taxes, which run to millions of dollars, provide huge revenues for the insurgents and makes counter-insurgency more difficult.

The use of technology by terrorist organizations in carrying out their activities has been on the increase, especially in the last decade. As the world embraces information technology, in particular social media for business and day-to-day activities, terrorist groups have also been able to use this media, which explains the foray into the use of drones. Terrorists now use websites, blogs, and social media platforms such as Facebook, Twitter, and Instagram to recruit new members, raise money, spread violent ideologies, and to showcase their activities. The first terrorist organization to use information technology was Islamic State of Iraq and the Levant (ISIS). From 2013, the organization used a wide range of social media and cyber technology to first convey a narrative of a global war and spread its ideologies and then to recruit members from around the world (Farwell 2014). Since the rise and fall of ISIS, other terrorist groups, including Boko Haram, have also seen social media and cyber technology as an effective tool to promote their activities.

Three main reasons explain why the use of drones are attractive to organizations such as Boko Haram. The first is the ability of Boko Haram to access enormous funds (as explained earlier) coupled with its success in using social media platforms, which encouraged the organization to invest in more forms of technology including drones. The ability of the group to raise millions of dollars a year provides it with the opportunity to venture into technology like drones (Johnson-Rokosu and Enobi 2016). The second reason is the ability to attract highly educated and tech-savvy members. While, in its initial stage, Boko Haram could only attract unemployed youths and aggrieved young men, it was eventually able to appeal to well-educated individuals after establishing itself. According to Ajala (2018a) "Over the years, however, the followers and those sympathetic to the course of Boko Haram have increased greatly. Apart from unemployed youths who see joining the organization as a means of livelihood, other members include Islamic and academic scholars who agree with the doctrines of the group" (Ajala 2018a, 122). In addition, Ogunlana (2019) argues that Boko Haram is now able to attract a new generation of members that are more technologically savvy. Third is the initial notion that Boko Haram was a rag-tag militia that would somehow fade away with time. When the Boko Haram insurgency started in the early 2000s, the Nigerian government and governments of other Lake Chad Basin countries erroneously dismissed the group and did not pay adequate attention to combating it and curbing its excesses (Mustapha 2014; Ajala 2021). Further-

more, the initial lack of 'seriousness' applied to the counter-terrorism initiatives was reflected in an inadequate use of technology in combating the group and has resulted in a situation whereby Boko Haram is able to deploy modern technology with the states having to catch up. Akwen, Moorthy, and Daud argue that while developing countries such as Nigeria involved in countering terrorism are unable to adequately deploy fourth industrial revolution technologies in fighting terrorism, the terrorists can acquire and use the technology, making counter-terrorism more difficult (Akwen, Moorthy, and Daud 2020).

The benefits of the opaque nature of drone warfare is not limited to state actors in Africa but extends around the world, offering non-state actors a perfect opportunity to deploy the technology, and has emboldened non-state actors such as Boko Haram. The primary use of drones by Boko Haram is for surveillance through which they can detect the location of advancing military forces and plan attacks (Akwen, Moorthy, and Daud 2020). The region where Boko Haram operates around the Lake Chad Basin adds further complications because of the topography. Hence, interorganizational cooperation among the countries to combat terrorism sometimes makes accountability more difficult. Despite the coordination and cooperation between these countries, there has been complaints that the countries do not fully disclose their operations, strategies, and intelligence to each other. This is because the countries are suspicious of each other due to issues relating to border control, which in effect limits cooperation and effectiveness (Albert 2017). The implication of this suspicion sometimes results in lack of accountability, especially when there are operational errors in the use of drones, effectively playing into the hands of the terrorists as drones flown by Boko Haram could be mistaken for states' drones as they all operate at the borders of these countries. Furthermore, this opaque mode of operations and lack of accountability makes it difficult to shoot down enemy drones as these drones could belong to allied forces. In order to be able to use drones effectively for counter-terrorism operations around the Lake Chad Basin, there is need for the MNJTF countries to first develop mutual trust and second be more transparent in their operations. This is particularly important for the use of drones because they could be effective counter-terrorism tools deployed by members of the MNJTF and their allies. At the same time, the gap presented by the lack of accountability offers terrorist groups the chance to deploy this technology in advancing their interests.

In proposing how the use of drones should be regulated, a Pax for Peace report argues that the African Union has a significant role to play in ensuring transparency surrounding production and use as well as accountability by member states. The report concludes that the African Union should have a more proactive position, with rules on the use of drones being watched by the African Commission on Human and Peoples' Rights who would closely monitor drone strikes and casualties as well as generate periodic reports on drone strikes by member states (Kurpershoek, Valdez, and Zwijnenburg 2021).

5 Conclusion

This chapter has discussed the challenges regarding the use of drones in West Africa and the Sahel. It highlighted the security difficulties facing the region and the ways nation-states in the region are addressing these challenges with technology and how drones are becoming increasingly important especially for surveillance and reconnaissance. The discussion highlighted how more countries are deploying drones either individually or with more developed partners, especially the United States and France. While drones offer a lot of prospects in terms of security, the chapter argued that its lack of regulation coupled with the opaque nature of drone warfare, especially in terms of accountability, could pose other forms of security challenge, such as human rights abuses, which insurgent groups often latch onto to boost recruitment. In addition, there is the risk that this lack of accountability could also result in the use of this technology by terrorist groups, with some already deploying drones to evade military formations and launch attacks. The chapter also explained how the financial standings of these groups coupled with their ability to recruit tech-savvy members have increased their foray into the use of drone technology, further weakening the security architecture in the region. To achieve success in the use of drones as an effective counter-terrorism technology, there is a need to establish transparency in its use as well as ensure accountability, which will not only deter terrorists from actively deploying drones on a large scale, but also assure citizens of these states that the technology will help maintain security without increasing human right abuses.

Seminar Questions

1. How has the use of drones impacted on counterterrorism operations in West Africa and the Sahel?
2. Do you think the use of drones in these regions could breed new forms of insurgencies as seen in Pakistan and Afghanistan? Discuss with reference to the differences in topography.
3. How can non-state actors and terrorist groups be prevented from using drones in the regions?
4. What are the potential implications of drone warfare in ungoverned/alternatively governed areas?
5. How can the governments of the countries in these regions harness the potentials of drone warfare especially in intelligence gathering and reconnaissance?

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Lukas Fiala

19 China’s Drone Diplomacy

Abstract: The proliferation of Chinese Unmanned Aerial Vehicles (UAVs) with potential military capabilities has coincided with China’s rise to become a major defense-industrial power and more assertive diplomatic actor under General Secretary Xi Jinping. China has emerged as a supplier of last resort for militaries across Asia, the Middle East, and Africa, offering an array of relatively advanced UAVs and capitalizing on ensuing diplomatic dividends. China’s drone diplomacy has been driven by three interconnected supply and demand side factors. Firstly, China’s domestic defense-industrial strategy has emphasized the development of unmanned capabilities and enabled Chinese state-owned defense firms to occupy a niche in the global arms market. Secondly, in desire of affordable airpower militaries across frontier and emerging markets have procured Chinese equipment in want of alternative suppliers such as the US. Finally, a more assertive diplomacy under Xi Jinping has in some cases tied the provision of advanced military equipment and defense-industrial capacity building to wider bilateral cooperation to reap diplomatic benefits from China’s advancements in this strategically important industry. Yet, in the context of deteriorating US-China relations, China’s evolving relationship with international non-proliferation regimes and the growing competition in the global military UAV market, the prospects of China’s drone diplomacy remain uncertain in the long-run.

Keywords: China, diplomacy, arms transfers, UAVs

1 China’s Drone Diplomacy: Drivers and Prospects

The proliferation of Chinese Unmanned Aerial Vehicles (UAVs) with potential military capabilities has coincided with China’s rise to become a major defense-industrial power and more assertive diplomatic actor under General Secretary Xi Jinping. According to the Stockholm International Peace Research Institute’s (SIPRI) Arms Transfers Database, Chinese defense firms have received orders for at least 388 UAVs – including their combat models – from 16 countries, mostly in Asia and the Middle East between 2010 and 2020 (SIPRI 2021). During the same time period, China emerged as the second largest producer and fifth largest exporter of major weapons systems globally, reflecting China’s steadily rising defense budget, estimated to have reached $US 293 billion in 2021 and the overall priority assigned to military modernization under General Secretary Xi Jinping (SIPRI 2022). Following Callamard and Rogers (2020), the following defines drone diplomacy as the provision of UAVs in pursuit of diplomatic and commercial aims, presenting China as an attractive supplier of last resort. Elevating the provision of advanced military equipment to the political level fits within China’s broader strategy of building ca-

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pacity in security sectors across different regions of the Global South. As a symbol of China's growing military prowess, combat UAVs have in some cases also become part of larger diplomatic "package deals" to consolidate existing bilateral partnerships.

Chinese arms transfers remain an understudied phenomenon in the literature. In the absence of a universally accepted theory of arms transfers, scholars have approached the subject from qualitative and quantitative directions. Studies establish a relationship between Chinese arms transfers and the need to secure natural resources (Yang 2020) and identify China's desire to step into markets previously dominated by Russia (Raska and Bitzinger 2020). Others highlight demand from markets in transition seeking to modernize defense and military capabilities and their ensuing willingness to cooperate with China on defense development as a driver of Chinese exports (Boutin 2018). According to Li and Matthews (2017, 174), as Chinese systems have moved up the value chain, "made in China" has begun to emerge as a distinct brand in the global arms market, reflecting how China's sales strategy has evolved from an initial focus on exports of "rudimentary equipment for political purposes" towards a more recent commercialization of exports "repositioning them from a low- to a high-tech foreign sales trajectory." In this regard, Solar (2020, 217) notes that "Chinese arms transfers in [. . .] the developing world reveal a complex security governance regime where the military, industry, and diplomatic policy communities interact." Building upon this literature, any explanation of what drives Chinese arms exports must therefore engage with both demand and supply side considerations.

This chapter seeks to contribute to this debate by explaining the proliferation of Chinese UAVs with a systematic framework. More specifically, it explains the emergence of China's drone diplomacy with reference to three interrelated supply and demand side factors: (1) China's accelerating defense-industrial development from the mid-2000s onwards which produced relatively advanced military equipment at a competitive price tag; (2) demand on the global arms market especially from markets in transition who see China as supplier of last resort as traditional Western exporters are constrained by international non-proliferation regimes regulating the transfer of certain UAVs; and (3) a more assertive diplomatic posture under General Secretary Xi Jinping in which arms transfers reflect China's growing willingness to formalize defense-industrial and military cooperation with foreign partners.

The remainder of this chapter first provides an overview of China's global UAV exports and then analyses the aforementioned drivers of China's drone diplomacy in more detail. The final section concludes by reflecting on the prospects of China's drone diplomacy in the context of deteriorating US-China relations, China's changing export control framework, and the global politics of drone warfare.

2 China's Drone Diplomacy: A Global Perspective

While China exported UAVs in the early 2000s, the country has only emerged as a major exporter since 2010. According to SIPRI's Arms Transfers Database, Chinese exporters have received orders for at least 388 UAVs between 2010 to 2020, of which 289 are confirmed to have been delivered (SIPRI 2021). As Figure 19.1 shows, while orders have been increasing overall towards the second half of the decade, they are skewed towards three years (2011, 2017 and 2018), reflecting procurement processes and underlying events, as explained in the next section.

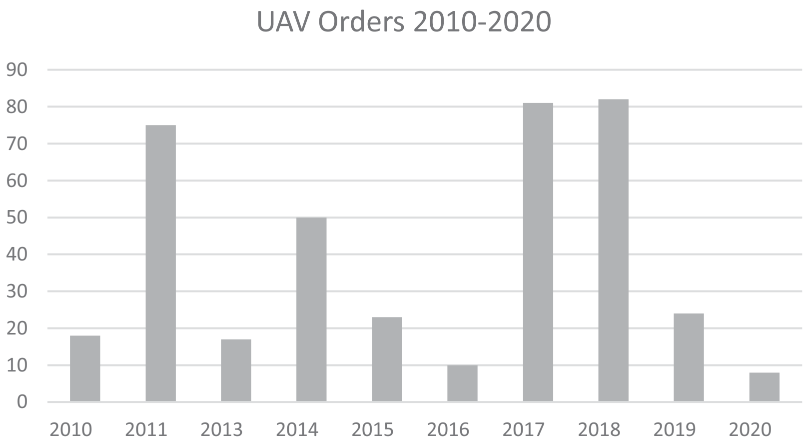

Figure 19.1: Recorded orders of Chinese UAVs from 2010–2020. Source: Stockholm International Peace Research Institute.
Note: Where no data was available for ordered UAVs, the author used numbers of confirmed deliveries to date. The analysis includes combat and reconnaissance versions of Chinese UAVs as both have potential military applications.

The demand for Chinese UAVs falls in to two broader categories: traditionally close partners of China in the realm of security and defense such as Pakistan located within China's broader regional neighborhood, and recipients further afield reflecting a turn to markets in the Middle East and North Africa, such as Saudi Arabia, the United Arab Emirates (UAE), and Algeria, with larger defense budgets and consequently greater purchasing power. China's turn towards South Asia and the Middle East also becomes evident when filtering available data by country. As Figure 19.2 shows, the five largest importers of Chinese UAVs (Pakistan, Saudi Arabia, Egypt, the UAE and Iraq) account for 79% of recorded global demand for Chinese systems. China has thus successfully taken advantage of a niche in the market that is concentrated among a few major and several smaller buyers willing to procure and operate Chinese equipment.

Over the last decade, Chinese defense firms have been able to close a handful of substantial deals for Chinese UAVs and consolidated their position in markets across

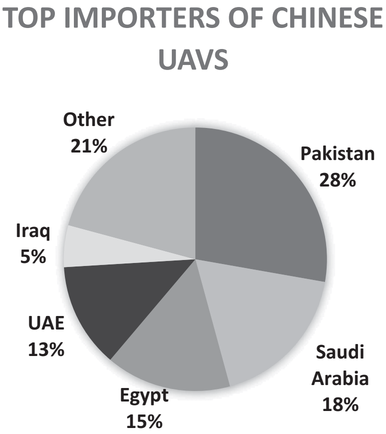

Figure 19.2: Global demand for Chinese UAVs by orders. Source: Stockholm International Peace Research Institute.

the developing world. Among the top-five importers of Chinese systems are also traditionally close security partners of the US, including Saudi Arabia and Egypt, demonstrating the extent to which Chinese UAVs have become a commercial and diplomatic success. While the relative change of China's drone diplomacy – from existing on the side lines of the global UAV market towards occupying a sizable global market share within a decade – is significant, export deals outside the top-five recipients are limited to smaller transfers between a handful to about a dozen UAVs. What is undeniable, however, is the fact that China's growing willingness to supply high-tech military equipment has coincided with the country's more assertive presence on the world stage.

3 The Drivers of China's Drone Diplomacy

The following consequently identifies three underlying drivers of China's drone diplomacy. Approached from a global perspective, three demand and supply side factors account for the proliferation of Chinese combat UAVs globally. Defense-industrial reforms initiated under Hu Jintao and accelerated under Xi Jinping, and a greater willingness to supply military technology as part of China's growing security cooperation agenda across emerging markets and the Global South, have provided the necessary supply side incentives. On the demand side, governments across the Middle East, Africa and Asia in search for low-cost airpower have turned to China either as a supplier of last resort or as an alternative defense and security partner to the US and its allies.

3.1 Military and Defense-Industrial Reforms

The first driver of China's drone diplomacy are domestic military and defense-industrial reforms aiming to produce advanced UAVs for domestic military modernization. The goal of developing unmanned systems (无人机) goes back to the 1960s, when the Sino-Soviet split put an end to defense-industrial cooperation between the two communist states. Forced into defense-industrial self-sufficiency, China began to develop the CK-1 (长空一号, Chang Kong) radio-controlled target drone, which was first successfully tested in December 1966 (Kania 2018). The project was spearheaded by Zhao Xu (赵煦), who is considered to be the father of Chinese drone engineering, and has advocated for the utility of UAVs as a "second airforce" (第二空军) besides the People's Liberation Army's Airforce (PLAA) (Zhao 2011). While UAVs have thus long captured the attention of Chinese military planners, they have more recently become a cornerstone of China's military strategy and defense-industrial development, reflecting an emphasis on "informationization" (信息化) and "intelligentization" (智能化) in China's military modernization (Kania 2018). At present, the People's Liberation Army (PLA) has used UAVs in military exercises and drills, reflecting how China's military sees UAVs as important for battlespace awareness including intelligence, surveillance and reconnaissance (ISR) capabilities, over-the-horizon targeting for missiles, data and communications infrastructure especially if satellites are compromised, and electronic warfare as part of information operations such as jamming (Kania 2018). Xi (2020) himself has recognized the importance of unmanned systems, stating that they are "changing the face of war" (改变战争面貌). UAVs thus form an increasingly important part of China's military equipment and have received senior leaders' attention as part of Xi Jinping's efforts to reform the PLA over the last decade.

The need to equip the PLA with modern UAVs is connected to China's defense-industrial strategy. Since the early 2000s, Chinese leaders have tried to build an integrate dual-use economy, reflecting the policy slogan "locate military capability in civilian applications" (寓军于民) (Cheung 2009). Under Xi Jinping, "civil-military fusion" (军民融合) has been elevated to a national-level strategy aiming to make use of China's dynamic and innovative commercial high-technology industry to advance the PLA's modernization (Alderman et al. 2014; Kania and Laskai 2021). While the implementation of civil-military fusion has encountered challenges in different sectors, China's growing domestic UAV market and industry offer particularly promising opportunities. For example, DJI, one of China's leading commercial UAV manufacturers, has obtained 76% market share in the commercial drone segment in the US market, reflecting the company's internationally competitive product range (McNabb 2021). The success of China's UAV industry has been fostered through targeted government support, providing financial backing and supporting the establishment of economic clusters for UAV development (Grevatt 2021). China's commercial UAV sector thus offers the opportunity to double-down on joint civil-military development.

The Wing-Loong (翼龙) series, is a good example of how defense-industrial policy has provided the foundation for exporting to the international market. As Figure 19.3

shows, the two Wing-Loong generations have become China's best-selling combat UAV by a considerable margin. The Wing-Loong-1 and -2 are medium-altitude-long-endurance (MALE) drones developed by the Chengdu Aircraft Design Institute (CADI), which is a subsidiary of the state-owned defense conglomerate Aviation Industry Corporation of China (AVIC). Chengdu has been a center of China's defense industry and is thus also a testing ground for civil-military fusion policies. One article published on the local government website, for instance, identifies CADI as an example of the military-civil development framework. In 2015, CADI was involved in the establishment of a regional commercial UAV industry alliance (商用无人机产业联盟) including the Chengdu-based University of Electronic Science and Technology (电子科技大学). The initiative aims to foster synergies along the industrial chain of UAV research and development. The same article references the Wing-Loong series in the context of successful longstanding civil-military cooperation efforts and dual-use development (Zhou, Li, and Chen 2018). A variant of the Wing-Loong-1 is also in operation with the PLA. The GJ-1 was initially developed from 2005 onwards and underwent testing from 2008 to 2009. The PLA Airforce (PLAAF) has employed the GJ-1 in progressively more sophisticated training aiming to integrate the UAV into the PLAAF's overall combat system. First publicly displayed at the 2016 Zhuhai Airshow, the second generation Wing-Loong UAV features a similar design and specifications to the US Reaper (Kania 2018). As part of corporate restructuring and defense industry reforms in the late 2000s, AVIC also received government support to expand globally. According to industry publications, in 2009, AVIC received $US 60 billion in state loans of which 25% were provided by China Exim Bank and intended to expand sales in foreign markets. A reported statement by an AVIC executive in 2010 accordingly details the firm's interest in markets in the Middle East and Africa, following a visit to the UAE, Tanzania and Kenya (Grevatt 2010). Supported by state capital, AVIC's commercial expansion into global arms markets reflects the nexus of defense-industrial policy and the emergence of Chinese defense firms as increasingly global players.

Overall, China's defense-industrial reforms catering to changing military requirements are thus an important explanatory factor in accounting for the rise of China's drone diplomacy. Central and local governments' focus on unmanned systems as important aspect of PLA modernization and defense-industrial development has aided companies such as AVIC to develop and produce sophisticated UAVs and thus compete in the domestic and international market.

3.2 Demand from Markets in Transition

Apart from supply-side reform, changing demand from overseas markets has created new commercial opportunities and, as a consequence, produced diplomatic dividends. Drones have not only captured popular imagination as the future of warfighting, they have also become symbols of modern military power. Beyond their symbolic value,

UAVs are a relatively low-cost option to enhance a military's ISR and airstrike capabilities, especially valuable when fighting takes place in remote and inaccessible areas (Süsler 2022). As Figure 19.3 demonstrates, China's Wing-Loong series has been in particularly high demand, the consequences of which can be felt across conflicts in Africa and the Middle East. Libya, for instance, has quickly become a key theater to observe the impact of UAVs on contemporary conflict. As Rogers (2021) notes, Egypt, Saudi Arabia, and the UAE not only have interests in the conflict in Libya, but also operate a considerable quantity of Chinese UAVs. UAE- and Saudi-operated Wing-Loong-2s have provided Khalifa Haftar and the Libyan National Army with air support against the UN-recognized Government of National Accord (GNA) and contributed to Haftar's early gains on the battlefield until late 2019. Since 2020, the growing impact of Turkish TB2s has helped the GNA to push back against Haftar's advance, reflecting how Libya has become a theater to observe the competition of Turkish and Chinese UAV systems as well as the consequences of UAV proliferation for future battlefields. In 2021, Egypt further informed a UN Panel that the UAE had stationed nine Wing-Loong-2 UAVs in Egypt as a part of bilateral defense cooperation, reflecting how Chinese systems have also affected security cooperation among regional powers in the Middle East and Africa (Kington 2019; Choudhury et al. 2021). Furthermore, Chinese UAVs have reportedly been used in Egypt, Nigeria, Ethiopia, and Yemen, showing how Chinese transfers are gradually shaping battlefields across the developing world by enhancing regional airstrike and ISR capabilities.

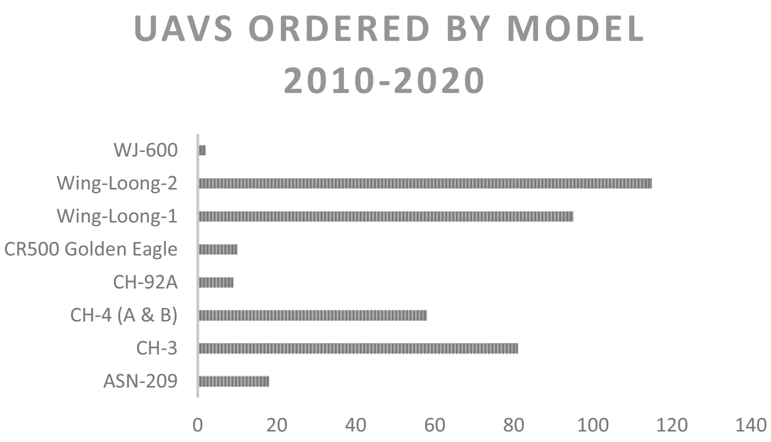

Figure 19.3: Orders for Chinese UAVs by model. Source: Stockholm International Peace Research Institute. For an overview of specifications for each UAV, see Alden et al. (2020).

Two factors have conditioned Chinese companies' market access and rendered China a supplier of last resort. On the one hand, Chinese systems represent a cheap alternative to Western equivalents. The Wing-Loong-2, for instance, is reported to cost

approximately $US 1 million without and $US 3 million with ground control equipment (Chandra 2021). In comparison, the US MQ-9 Reaper comes with a price tag of about $US 14 million (Hambling 2020). There is thus a clear budgetary incentive to choose Chinese systems over alternatives for cash strapped militaries across the developing world.

On the other hand, Chinese suppliers have stepped into a void left by the US due to its obligations under the Missile Technology Control Regime (MTCR). Though the MTCR aims to limit the proliferation of nuclear, biological, and chemical weapons systems and related technology through export policy guidelines, it classifies UAVs capable of carrying a warhead as cruise missiles subject to high export restrictions. Military UAVs and related sub-systems and software were included in the MTCR Category 1, consequently imposing an unconditional "strong presumption of denial" on export license applications (MTCR 2022). While the Trump administration announced a reinterpretation of the MTCR Guidelines so as to exclude unmanned aerial systems with a maximum speed of less than 800 km/h from Category 1 in July 2020, before this decision the US had been constrained to compete in the global market for armed UAVs with China (White House 2020). Saudi Arabia, for instance, acquired Chinese UAVs after being unable to buy US equivalents. Other partners of the US in defense and security with larger defense budgets and thus procurement capabilities including Egypt and the UAE have also imported large quantities of Chinese combat UAVs. The Trump administration's willingness to finalize a deal with the UAE for 50 fifth-generation F-35 Lightning II aircraft and 18 armed MQ-9 Reaper UAVs in January 2021 was interpreted to indicate Washington's growing conviction to challenge China's foray into the global UAV market. The suspension of the deal under the Biden administration later in December 2021, however, suggests that China may retain market share for the short-to-medium term including all the diplomatic dividends this entails (Iddon 2022). While China nominally follows the MTCR's guidelines, Beijing is not party to the regime and thus skirting the MTCR's non-binding rules, norms, and regulations. Taken together, the desire for low-cost airborne capabilities and legal constraints of China's competitors have been important drivers of China's drone diplomacy.

3.3 China's Assertive Diplomacy under Xi Jinping

Domestic defense innovation and growing demand for Chinese systems has further coincided with China's more assertive diplomacy under Xi Jinping, characterized by the growing willingness to use security and defense cooperation to bolster existing diplomatic relationships across the Global South. Xi has ushered in a 'new era' (新时代) of Chinese diplomacy characterized by more actively fostering an external environment favorable for China's development. Xi's flagship policy in this regard is the Belt and Road Initiative (一带一路, BRI). Announced in 2012, the BRI started out as a Sinocentric land- and sea-based connectivity and infrastructure initiative and has since then broadened to

include digital, outer space, cultural and security domains spanning across the globe. In Africa, for instance, Xi has tied security cooperation under the Forum on China-Africa Cooperation (FOCAC) to the BRI, reflecting a growing willingness to play a more active role in security overseas (MOFA 2018). There are several reasons for China's more active security engagement. One the one hand, a more engaged PLA and Chinese crisis diplomacy aims to mitigate negative externalities of China's growing economic footprint along the BRI such as Chinese citizens' and investments' exposure to conflict and instability. On the other, Xi has identified security cooperation as an important tool to consolidate already existing diplomatic partnerships. Bilateral capacity building, including through defense diplomacy, arms exports and offset arrangements, presents China as a partner of choice while corresponding to demands from regional governments interested in skills and technology transfers (Boutin 2018; Benabdallah and Large 2019). This diplomatic adjustment has coincided with China's aforementioned rise to become a relatively advanced defense-industrial power and supplier of military technology, consequently putting in place the necessary prerequisites for China's drone diplomacy.

At the same time, Chinese defense companies have become embedded in China's broader commercial presence along the BRI. In relation to China's drone diplomacy, this manifests in the form of defense-industrial off-sets, reflecting recipient countries' aim to localize the benefits of defense cooperation with China through technology transfer and production capacity. Both of China's most exported UAVs, for instance, are included in such offset arrangements. In October 2018, it was announced that the Pakistan Aeronautical Complex and the aforementioned AVIC would jointly produce 48 Wing-Loong-2 UAVs for use in the Pakistan Air Force. Saudi Arabia, on the other hand, has entered into a cooperation agreement with the China Aerospace Science and Technology Corporation (CASC) to establish the first factory for Chinese UAVs in Middle East in 2017 (Gady 2018). At the biennial International Defense Exhibition and Conference (IDEX) in Abu Dhabi, the Saudi Technology Development and Investment Company (TAQNIA), a subsidiary of Saudi Arabia's Public Investment Fund, and China's Aerospace Long-March International Trade (ALIT), a CASC subsidiary responsible for exporting and importing aerospace equipment, agreed on establishing a UAV production line. This was followed by a partnership agreement between the King Abdulaziz City for Science and Technology (KACST) and CASC in March 2017. The facility eventually became part of a larger $US 65 billion package deal signed in Beijing during a meeting between Xi Jinping and Saudi Arabia's late King Salman in 2017, signaling closer cooperation under the auspices of the BRI across energy, education, culture and other policy areas (Diamond 2017; Xinhua 2017). The deal consequently reflects how military UAVs are connected to China's broader commercial and diplomatic engagement in the Middle East.

In addition to off-sets, Chinese suppliers have also begun to improve servicing infrastructure across the region. The China National Aero-Technology Import & Export Corporation (CATIC), which is responsible for representing AVIC in the global market, further entered into an agreement with Global Aerospace Logistics to open a new

Middle East and Africa Distribution Center (MEADC) in the UAE (EDGE 2019). The deal formalizes an Memorandum of Understanding signed by the two companies during a visit of Sheikh Mohamed bin Zayed Al Nahyan, Crown Prince of Abu Dhabi, to China in July 2019 (Abbas 2019; Xinhua 2019). During another meeting in 2022, Xi Jinping said “China is ready to strengthen the alignment of development strategies with the UAE” and promised to actively advance cooperation under the BRI. For Xi, this includes working with the UAE “to expand cooperation in new and renewable energy, aerospace and other fields” and to “ramp up cooperation in counter-terrorism and other fields to safeguard the common security of the two countries” (MOFA 2022). Announced the Dubai Airshow in 2019, the Center will improve operations and servicing including the supply of spare parts across the region, and “reduce repair times from months to weeks” (Hart 2019). There is thus a clear incentive to consolidate AVIC’s long-term standing in the region by providing better servicing arrangements for existing clients, supporting Xi’s remarks to advance China-UAE cooperation in aerospace.

These examples point to an interesting trend in Chinese high-technology arms transfers. Disaggregating commercial and state interests in China’s “going out” strategy (走出去战略) has notoriously been a difficult endeavor. Chinese defense firms are certainly aware of the potential to access new markets across the Middle East and Africa, as evidenced by Figure 19.2 above. The fact the deals emerged from regional defense expos suggests commercial interests were initially a driver behind cooperating on production and servicing facilities. Yet, the packaging within a broader diplomatic framework reflects Beijing’s willingness to elevate defense-industrial cooperation within the respective bilateral partnerships. It further suggests China’s ambition to step into the void left by alternative suppliers such as the US to leverage the supply of advanced military equipment to for diplomatic benefits. In particular, China’s growing UAV market share across the Middle East reflects the priority China attaches to the region and the headway Beijing has made in recent years to court key regional players including Saudi Arabia and the UAE (Fulton 2019). In Africa, UAV sales augment China’s longer-term commitment to security and defense cooperation (Boutin 2018). China’s UAV exports must not be decontextualized from these regional strategies but should be seen as an important element of China’s diplomatic outreach.

Individual examples therefore crystallize the complex interplay of several supply and demand side drivers behind China’s drone diplomacy. Domestic defense-industrial actors in China are increasingly interwoven with China’s global diplomatic presence, facilitated by advances in defense modernization, a more assertive diplomatic strategy under Xi Jinping, and the desire from markets in transition to procure advanced UAV capabilities. China’s drone diplomacy has thus yielded initial diplomatic dividends by bolstering broader bilateral cooperation frameworks and rendering China an attractive supplier of last resort.

4 Flying High? The Prospects of China's Drone Diplomacy

Despite its initial success, several factors will shape and potentially constrain China's drone diplomacy going forward. While progress and innovation in China's domestic UAV sector has been remarkable, Chinese systems also suffered from important reliability issues. For instance, after having procured six CH-4 UAVs in 2016, the Royal Jordanian Air Force (RJAF) put all of them up for sale citing performance issues in 2019. The Assistant Commander of the RJAF expressed the military's dissatisfaction with the CH-4 in a publicized interview in 2018, giving no clear explanation as to how and why the CH-4 underperformed (RUSI 2022). Similarly, several reported crashes of CH-4 UAVs in Algeria have likely led to reconsiderations regarding the procurement of CASC's CH series (GDC 2021). However, these reliability concerns seemed to have been only a temporary set-back for Chinese suppliers and perhaps boosted sales of the Wing-Loong series as a more reliable substitute produced by CASC's competitor AVIC.

Yet, in the near- to medium-term future, China will have to compete with other emerging 'drone powers' for market share across the Global South. Turkey, for instance, has recently made inroads into African and Middle Eastern markets with implications for regional conflicts in Libya and Ethiopia (Walsh 2021). Haluk Bayraktar, the CEO of Baykar Defense, the Turkish manufacturer of the well-known TB-2 UAV, claimed in one interview that Baykar provided the market with a "better option" compared to China. Bayraktar was referring particularly to countries in China's geographic neighborhood in Asia that may be hesitant to procure from Chinese suppliers for political reasons or are looking to avoid one-sided defense-industrial dependencies (Tavsan 2022). China is likely aware of this competition. At the Zhuhai Airshow in November 2022, the state-owned defense firm China Electronic Technology Corporation (CETC) displayed a UAV with a similar appearance as the TB-2, prompting some industry observers to argue China may have copied the latter to imitate its commercial success (Malyasov 2022). These accusations are difficult to verify at the time of writing but, if true, could indicate China's strong conviction to remain competitive in the global market for military UAVs. What is clear, however, is that UAVs have become yet another focal point of interstate competition in the technology realm between China and NATO. One article publicized by Chinese state media, for instance, questions the utility of Turkish UAVs in the context of the war in Ukraine (Xinhua 2022). While likely more of a propagandistic move to amplify Russian framings of the war in line with Beijing's close relationship with Moscow, the larger context of the tit-for-tat between Turkish and Chinese commentators about the other's UAVs attests to how these weapons systems have become an inflection point of interstate competition over the future of military technology. In the context of the aforementioned battle for "drone supremacy" in the Libyan conflict, how Chinese defense firms navigate this

changing global arms market will certainly shape the extent to which China will be seen as a supplier of last resort and capable of leveraging the provision of sought-after military equipment for diplomatic gain.

Another factor that may shape the development of China's drone diplomacy in this regard is the growing geopolitical competition between the US and China. On the one hand, arms transfers may increasingly be seen as a tool to wield strategic influence at the expense of the rival great power's standing, reminding of the Cold War era when China's arms exports largely followed ideological contours. China could readily exploit areas in which it occupies a niche in the high-end spectrum of the global arms market to enhance bilateral ties with partner countries. Despite a failed deal with Saudi Arabia, President Biden has generally decided to keep the Trump administration's reinterpretation of the MTCR in place, suggesting that Washington views UAVs through the lens of US-China competition (Stone 2021). Already in 2019, then US Secretary of Defense Mark Esper publicly acknowledged that "the Chinese government is already exporting some of its most advanced military aerial drones to the Middle East," showing China's advancement in the global market for military UAVs has not gone unnoticed in Washington (Tucker 2019). In a world where US-China relations are increasingly framed in zero-sum terms, importing advanced Chinese military equipment may constitute a choice between US and Chinese spheres of influence. Given the market for Chinese UAVs has been concentrated among a few major buyers, an intensification of US-China competition may impact Chinese companies' ability to access these markets. If traditional security partners of the US such as Egypt and Saudi Arabia continue to double-down on Chinese UAVs, this may contribute to further polarization between Washington and Beijing as China will be perceived to challenge US primacy in niche sectors of the global arms market.

On the other hand, Washington's growing conviction to enforce technological decoupling from China may present a challenge for China's UAV manufacturers and even the defense industry at large. China's largest state-owned defense conglomerates, including China's most successful UAV manufacturers AVIC and CASC, were added to the US entity list under the "Chinese Military-Industrial Complex Sanctions Regulations" (OFAC 2022). The US Treasury Department also put DJI, the world's most successful commercial and civilian UAV producer, on an investment exclusion list, prohibiting US citizens from trading shares of the company. While mostly seen as a symbolic gesture as DJI is a private company and not publicly listed, the move does suggest US officials see China's UAV industry as a strategically important sector (BBC 2021). This was further confirmed by the Department of Defense's decision to blacklist DJI in October 2022, potentially clearing the way for future sanctions on the company (Al Jazeera 2022). In the same month, the Biden administration further imposed unprecedented export controls on semiconductors, not only prohibiting US firms to work with Chinese counterparts but also including US citizens and green card holders working in China's semiconductor industry. While the implications of this latest wave of sanctions for China's defense-industrial modernization are not yet clear, China will likely need to find a laborious

way to replace latest generation semiconductors in the future or risk falling behind its international competitors (Beattie 2022). Nevertheless, the report of the 19th Central Committee at the 20th Party Congress in October 2022 featured the emphasis on speeding up "the development of unmanned intelligent forces" (无人智能作战力量发展), suggesting that China will continue to focus on achieving an advantage in the global UAV market despite geopolitical headwinds (Xi 2022).

Finally, China's evolving relationship with multilateral export control regimes and treaties may also shape China's drone diplomacy in the coming years. While skirting the MTCR, China has become a party to the Arms Trade Treaty (ATT) in October and ratified a new export control law in December 2020. China's obligations under the ATT apply to the transfer of UAVs at least when they are armed, suggesting China would have to deny UAV exports if it has knowledge at the time of transfer that armed UAVs may be used to commit human rights abuses (Giacca 2013; ATT 2022).[1] In this regard, China's new export controls aim to "improve its legal and regulatory system for export controls" drawing on domestic and international best practices. The law is China's first unified export control regime, including "unified rules for export control policies, a control list, temporary controls, a restricted name list, and supervision" (SCIO 2021). The law thus focuses on improving both institutional and procedural aspects of export licensing in China and includes an emphasis on post-shipment controls. However, it remains to be seen how new legal frameworks and multilateral commitments will affect China's position in the global arms market and to what extent more extensive export control commitments on paper will affect strategic arms transfers in practice.

Overall, it will be important to observe how China's evolving relationship with global non-proliferation regimes interacts with the country's growing role as a security actor and accelerating competition with US. One area to monitor in this regard is the degree of autonomy of UAVs. Chinese military experts and researchers are debating concerns linked to the proliferation of autonomous weapons systems and China has also affirmed its interest in a multilateral solution to the governance of autonomous killing at the UN. However, at times Chinese definitions of what constitutes 'autonomy' have laboriously omitted the types of weapons systems the PLA – and most other major militaries – would develop and deploy, including, for instance, the inability to terminate the device once launched (Kania 2020). For now, Chinese UAV exports to countries whose militaries feel little responsibility to obey the law of armed conflict may cause further proliferation risk, especially in cases where insufficient post-shipment monitoring elevates the likelihood of Chinese systems ending up with a third party or non-state actor.

1 The treaty text: "it has knowledge at the time of authorization that the arms or items would be used in the commission of genocide, crimes against humanity, grave breaches of the Geneva Conventions of 1949, attacks directed against civilian objects or civilians protected as such, or other war crimes as defined by international agreements to which it is a Party."

In conclusion, China's rise to become an exporter of advanced military UAVs opens a microcosm of interlocking supply and demand side dynamics including defense-industrial policy, changing global demand, and evolving diplomatic engagements. These dynamics are not only a feature of growing competition between the US and China, but attest to a transition towards a complex global order in which the proliferation of military UAVs is driven by a growing number of suppliers including Turkey and supported by a growing customer base across the Global South. While China's drone diplomacy may have achieved initial diplomatic aims in the form of closer security cooperation with foreign partners, it thus remains to be seen whether Chinese UAVs will continue to "fly high."

Seminar Questions

1. What are the drivers of China's 'drone diplomacy'?
2. Who are the main importers of Chinese UAVs and why?
3. How do arms exports and especially UAV sales augment China's broader diplomatic engagement in the Middle East and Africa?
4. What have been the consequences of Chinese UAV exports for conflicts in Africa and the Middle East?

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Samuel Bendett

20 Russian Military Drones: Established and Emerging Technologies in Ukraine

Abstract: Russia's invasion of Ukraine is bringing into sharp focus the development and use of military drones and uncrewed aerial vehicles by the Russian military. After facing a range of challenges, problems, and setbacks in 2022, the Russian military finds itself with potential solutions that involve building on the existing domestic drone technology, importing available solutions from friendly countries, and developing new systems to enable the forces to maintain relative parity with Ukraine's successful drone operations. These developments include long-range combat drones, additional investments in loitering munitions, and commercial UAV technology.

Keywords: Ukraine, Russia, MOD, UAVs, drones, uncrewed aerial vehicles, autonomy, artificial intelligence, loitering munitions, quadcopters, FPV drones, swarms

1 Introduction

The ongoing Russian invasion of Ukraine is the stage for one of the most intense uses of uncrewed aerial vehicles (UAVs) and drones for military combat. The war has challenged and upended some assumptions and predictions about the use of this technology by the Russian military and has revealed how quickly different concepts can evolve in a complex battlefield environment. With the Russian UAV use attaining global focus via round-the-clock updates on social media networks like Telegram, this chapter is intended to be a part of the larger dialogue on the Russian development and fielding of military aerial drones, with information drawn from English- and Russian-language public sources. This chapter is also meant as a snapshot in time that attempts to encapsulate the state of the Russian drone use well into 2023 and 2024.

At this point in the overall UAV development cycle, most drones in Russian service are remote controlled by an operator, an important distinction from the larger narrative that often puts UAVs in the "autonomy" classification as way to discuss systems that lack a human pilot (Biryulin 2020). As with many militaries around the world, the Russian Ministry of Defense (MOD) was deliberating gradual drone evolution to include an ever-growing share of advanced autonomous systems to deliver precision strikes, with drones that can potentially fly in a swarm and with manned aircraft, while interacting with ground and maritime assets in the Russian version of net-centric warfare (Biryulin 2020). Such proposals and ideas are still deliberated in the MOD, even if the war in Ukraine and the resulting reallocation of available resources towards present military needs may have pushed the autonomous UAV introduc-

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tion timelines further to the right (Tass 2022a; 2022b). Prior to the invasion of Ukraine in February 2022, the introduction of artificial intelligence into the aerial drone control systems, and integrating UAVs into common airspace with manned aircraft, were a staple of analysis across MOD military academies and research institutions that pondered the impending technological evolution and the utility of UAVs in combat (Biryulin 2020).

In fact, the Russian planning for UAV evolution did not differ too much from the views and predictions held today by global drone development leaders such as the United States, Israel and China (Losey 2022; Barnett 2022; Bensaid 2021; Shoaib 2022a). That is, following the fielding of current and widely used remote-controlled UAVs, more sophisticated and likely autonomous drones should eventually emerge to deliver longer and more precise strikes, while gradually phasing out piloted and manned flights on dangerous missions. Prior to February 2022, Russia's public defense discourse and analysis reflected a military that has apparently understood the lethal lessons of the 2020 Nagorno-Karabakh war, and has understood its own post-2015 drone-flying lessons in Syria as a way forward with the development of UAV tactics, techniques, and concepts. These lessons involved the increasing use of long-range combat drones, massed loitering munitions use, and persistent coverage by numerous ISR (intelligence, surveillance and reconnaissance) UAVs to guide ground and aerial assets to targets (Litovkin 2021).

2 Russian Drones in Ukraine – Reality Check

Today, most of the ISR drones providing situational awareness to Russian ground forces in Ukraine include Eleron-3, Orlan-10, Orlan-30, Takhion, Zastava, Supercam, and Granat and Zala variants that have a range between 15 and up to several hundred kilometers. Many of these drones are integrated into the reconnaissance-strike and reconnaissance-fire contours (complexes), a concept that connects and guides ground-based missile, mortar, and artillery units to targets via real-time monitoring and fire correction from aerial drones. Such tactics often involve Orlan-10, Orlan-30 and Zala drones (Milenin and Sinnikov 2019, 50–57). Some of the drones mentioned above were developed and tested before the Ukraine invasion, with some drones seeing action in Syria, where these UAVs flew mostly in a countermeasures-free environment against a technologically weaker adversary.

Of these, Orlan-10 constitutes the largest percentage of the roughly 2000-strong pre-2022 UAV force often quoted in Russian state media sources. It remains a relatively cheap and versatile platform today, used widely across the front. Halfway into 2022, there was an attempt by the Russian MOD to convert this ISR drone into a light strike platform, although there has been little reporting on that development in the Russian-language media after a few initial attempts. Given the high intensity of combat over Ukraine, many Orlans were lost to Ukrainian air defense countermeasures

and some to electronic warfare "friendly fires" and pilot errors, depriving large parts of the Russian ground forces of the continuous aerial observation and information gathering (Finance.Yahoo 2022). In response to this apparent capability gap, a growing share of the tactical-level data collection up to 10 km out is currently done by commercial-type quadcopters that quickly became indispensable for the Russian ground forces and their Donbas allies.

Unlike the ISR drones mentioned above, the Russian defense industry was unable to manufacture small tactical-level quadcopter drones in significant numbers, forcing the Russian military to rely on the Chinese-made DJI and other imported models like Autel that are purchased and provided by Russian volunteers. These quadcopters provide ISR front-wide tactical-level support (1–10 km) to intelligence, Special Forces, assault units, marine and airborne (VDV) formations, and artillery and mortar units (Versia 2022). Such commercial drones have emerged as one of the key reconnaissance tools, with operators observing and identifying adversary fortified areas, camouflaged dugouts, equipment, weapons and systems, individual military personnel locations and movement, while adjusting artillery fires and interacting with assault squads as the "eye in the sky" (Kots 2022). Some Russian military commentators reporting from Ukraine note that any howitzer, with proper adjustment from the air via such a drone, turns into a "sniper rifle," not only greatly increasing the efficiency of fires, but also dramatically reducing the consumption of ammunition (Kots 2022).

Prior to the Ukraine invasion, Russian defense industry fielded two domestic loitering drones – KUB and Lancet variants, both made by Kalashnikov Enterprise. Well into 2024, these drones are getting an increasing share of combat, especially the Lancet-3 variant that the Russian state media is touting as successful against Ukrainian military targets like long-range artillery systems (Chernysh and Aksenov 2022). With at least a thousand used through 2023, and possibly more on the way, the Russian defense industry is apparently gearing up for more Lancet manufacturing. Both KUB and Lancet have a range of less than 60 km, limiting their ability to strike beyond this range at Ukrainian targets. To make Lancets even more effective, the Russian military is pairing them up with Orlan-10 and Zala drones that can guide these munitions to targets, while providing real-time situational picture (Iz.ru 2022).

Before the Ukraine invasion, the Russian military fielded two medium-altitude, long-endurance (MALE) drones – Forpost-R and Orion – to provide Russian forces with a potential 250 km striking range. At the same time, these UAVs still exist in too few numbers to make a significant difference in Ukraine. Apparently, they are now mostly relegated to ISR role for other drones and striking platforms as a consequence of Ukraine's air defense cover, while taking advantage of their more advanced optics than the previously mentioned aerial platforms. For years, the Russian defense establishment has observed the utility and success of Western, Israeli, and Chinese-made long-range combat drones in various conflicts, eventually developing two heavy combat UAV prototypes – Altius and S-70 Okhotnik. Altius has a reported range of up to 10,000 km, conceptually putting it on the par with the US-made Global Hawk UAV, while the heavy,

blended-wing Okhotnik was designed as an interceptor and a ground-attack vehicle to overcome adversary air defenses, radar stations and possibly even military aircraft (Ramm 2021a; 2021b).

While both heavy drones sound like exactly the type of systems needed by the Russian military in Ukraine, both of these UAVs are still undergoing testing, with potential manufacturing possibly starting sometime in 2024–2025 and their eventual entry into a war in question (Tass 2022a; 2022b). Lacking the capacity to launch long-range drone strikes against Ukraine, the Russian military turned to Iran and imported hundreds of Shahed-136 and Shahed-131 loitering munitions that the MOD is flying under Russian names Geran-2 and Geran-1, respectively (ArmyRecognition 2022). These drones are flown in large numbers as a complement to cruise missiles at mostly civilian stationary targets all over Ukraine, allowing the Russian military to keep pressure on the civilian population, the Ukrainian government and its military by continuously targeting the energy infrastructure and challenging the Ukrainian airspace (Ukrainian President 2022).

By early 2024, the Russian military is still trying to adapt to the constantly changing Ukrainian battlefield, seeking to shore up their own military setbacks across different parts of the front with new tactics and concepts. Aerial drones are an integral part of this approach, and the MOD is utilizing a number of domestic and imported solutions to shore up its defenses. With the Russian President warning that this conflict may be a long war (Polityuk 2022), the following key patterns are impacting Russian military's use and development of UAVs and drones, as well as its thinking about the role such technologies could play in future conflicts.

3 Combat Drones

The war in Ukraine laid bare Russia's lack of a key combat uncrewed aerial element, notably the large-scale use of mid- to long-range Uncrewed Combat Aerial Vehicles (UCAVs) that could potentially make a significant impact against Ukrainian forces. The rather limited introduction of Forpost and Orion drones exposed the fact that air defenses can make life difficult for these UAVs that have a relatively slow speed and low flight ceiling. While the war has extracted a toll on the Russian industry and has affected some parts of the military-industrial complex with the imposition of sanctions, the MOD is still sponsoring multiple UCAV projects that are planned for the development, testing, and military evaluation between 2024 and 2025.

These projects include the aforementioned Okhotnik and Altius high-latitude combat drones, which were presented as the Russian forces' emerging "tip of the high-tech spear" and the beginning of a replacement of human pilots from the most dangerous missions via AI-enabled command and control (Edmonds et al. 2021). These projects also include the Sirius combat drone as the next-generation evolution of an

Orion UAV, Helios long-range ISR drone, and Grom "loyal wingman" concept similar to the American Kratos, all made by the Kronstadt Enterprise (Zakvasin and Komarova 2022; Vikont 2022). Other potential UCAVs that might go into an eventual mass-scale production may include Korsar mid-range drones that briefly made an appearance in Ukraine (Focus 2022). The common underlying characteristic for the above-mentioned aerial vehicles include planned resistance to the electronic warfare (EW) countermeasures, improved and secured command and control channels, and the ability to perform at least part of their missions autonomously.

Other criteria dictated by the ongoing war is the ability to fly drones at long ranges from deep inside Russian territory, out of concern for Ukrainian strikes against Russian airfields and bases (McLeary and Banco 2022; Shoaib 2022b). The Russian military's concepts are also dictated by the application of this technology in an environment dominated by sophisticated layered air defense, radars, and EW systems. At the same time, these heavy Russian drone projects exist today as single prototypes and proofs-of-concept platforms, and questions remain about the Russian defense industry's ability to truly scale up production of such sophisticated technology amidst the growing sanctions impact on the defense sector (Yahoo 2022).

4 Loitering Munitions

A significant lesson that the Russian military drew from Syria and the 2020 Nagorno-Karabakh war was the importance of loitering munitions as a necessary asset in modern conflict. The Russian defense industry responded by fielding KUB and Lancet drones in Syria in February 2021, apparently to positive reviews (Ramm 2021a; 2021b). As of this point in the Ukraine war, the Russian military is using a growing number of these munitions to go after Western-provided long-range artillery platforms, a key target for the Russian forces. The KUB flies along the target coordinates entered by the operator, while the Lancet variants detect the target with the help of a reconnaissance/repeater, with flight corrected by the operator (Game of Drones 2022b). The Russian military continues to rely on these drones well into 2024, with possible plans including the development more advanced versions that feature a greater degree of autonomy and possible swarming capabilities.

However, Russia will also continue to rely on imported Iranian loitering munitions like Shahed-136 and Shahed-131 as its go-to technology for long-range strikes against Ukraine. Relatively cheap and plentiful – Russia apparently purchased hundreds for its recent strikes and intends to manufacture thousands domestically – they have become the symbol of reducing the aerial drone concept down to its basic components. Shaheds are not sophisticated – they operate more like cheap cruise missiles since they fly along GPS coordinates (Harris et al. 2022). The roughly $350K cost per drone enables mass-production of this UAV with numerous commercial components

(Lister 2023), and its ability to fly hundreds of kilometers inside Ukraine puts practically the entire country in Russia's cross hairs.

The Russian military will likely build on this technology against Ukraine by developing new tactics and concepts for its further use (EuromaidanPress 2023). Russia intends to field large numbers of Gerans/Shaheds as a way to pressure Ukrainian civilians and its military by continuous strikes against Ukrainian infrastructure (Nissenbaum and Strobel 2023).

At the same time, it is important to acknowledge that this is a new development for the Russian military, and the first time it has such capacity that bridges the gap between its short-range ISR and loitering drones, and its long-range missiles and air force strikes. Further resource allocation is key to building Gerans in large numbers, and questions remain whether the MOD will choose to invest more into such loitering drones as a short-term successful solution against Ukraine; or whether it will also continue to allocate resources to costlier domestic projects like heavy combat drones outlined above.

5 Proven Technology Like the Orlan-10-Type Drones

During the war in Ukraine, the Orlan-10 UAV emerged as Russian military's go-to drone for aerial reconnaissance, situational awareness, and EW countermeasures. Maintaining such capacity will be considered paramount for the military that is trying to rebuild its drone fleet. Many Telegram-based Russian military commentators and correspondents who are present on the ground in Ukraine consider scaling up successful drone practices and technologies as absolutely paramount (Chadaev 2022). Despite relatively large pre-war Orlan-10 numbers on paper across the Russian military, it quickly became apparent that even hundreds of such drones eventually proved too little after months of combat across Ukraine's large battle front (Chadaev 2022). To address the "Orlan gap," the MOD recently claimed that deliveries of this drone to the front line are up "53-fold," indicating a growing domestic industrial capacity to meet this demand (RIA 2023).

Apart from an Orlan-10 with a range of up to 120 kilometers, the Russian commentators are expressing a need for sufficient autonomy for the drone as a reflection of the Ukrainian combat environment saturated by different type of countermeasures that are specifically designed to impact UAVs (Rogozin 2022). It is likely that despite the growing sanctions impact, the Russian defense establishment will continue building and fielding Orlan-10 and a growing number of Orlan-30 drones (Nevnov 2022), as a proven technology that so far has no visible replacement on the horizon.

6 Small Quadcopters

The conflict in Ukraine was the first in history with such massive use of civilian drones by all belligerents, who fly many Chinese-made DJI variants like Mavic and Matrice models. The commercial quadcopter drone has become a new symbol of modern warfare, and its importance is now recognized by many in the Russian military leadership (RIA 2022b). Russian forces and their allies are now actively using such technology provided by a country-wide volunteer effort (Astrakhan 2022). With the volunteer organizations and the MOD training the soldiers on how to operate such quadcopters for ISR, combat, and artillery correction missions, there is a practical recognition that such drones enable Russian forces in the short to medium-term, as the war drags well into 2024, with the Russian units requiring continuous tactical-level situational awareness. At the same time, the Russian defense industry is seeking to launch its own mass-scale military and civilian-type quadcopter production to fill the tactical needs identified by the nation's forces, although the result of such efforts is far from certain (RIA 2022a).

This is one of the defining Russian combat trends in this war, as more domestic enterprises, volunteer-based organizations, and regional industrial clusters are announcing plans for small combat drone manufacturing. Such efforts are not coordinated, and technical information is still not shared among these participants. Some Russian defense commentators and correspondents call for a quadcopter production rate in the hundreds of thousands to saturate the forces down to the squad and platoon levels with this cheap and expendable technology (Kots 2022). At the same time, it will not be possible for such domestic developments to fully replace the ubiquitous DJI drone that has become organic to so many military formations and units. The Russian soldiers hold DJI in high esteem due to the simplicity of its use and operation and prefer this particular UAV to others if given a chance. Russia's defense industry also depends on Chinese components and microelectronics for small drones, as evidenced by Almaz-Antey's fielding of a quadcopter that was made with both Russian and Chinese parts (RIA 2022a). This particular quadcopter was criticized by many Russian commentators as basically a Chinese drone with a Russian label, reflecting the inability for large defense enterprises to shift from producing expensive, multi-use, and long-range UAV platforms towards small, expendable, one-way attack drones.

In 2023, FPV-type drones (first-person view, usually a term for small racing drone) became the go-to solutions for fast tactical strikes against stationary and moving targets. These "kamikaze"-type drones that can carry a rocket-propelled grenade (RPG) warhead or a mortar munition essentially emerged as cheap and expendable missiles that cost very little to put together, with most costing between $500–$2,000 dollars. While FPV drones require more experienced pilots to operate them, they can provide a different-level advantage when compared to DJI-type quadcopters. FPVs can fly faster than standard quadcopters and thus can be less susceptible to EW countermeasures, since it is difficult to identify them at speed while in flight (Rybar 2023).

The Ukrainian military was the first to utilize this technology to strike Russian tanks and armored vehicles, adding yet another threat layer to Russian ground forces. By spring 2024, the Russian military also started to utilize FPVs in significant numbers, with Russian volunteer groups building as many as 100,000 FPVs per month (Two Majors 2023). Both DJI-type quadcopters and FPV drones have emerged as an organic capability, provided mostly by volunteers, with the Russian military slowly integrating such drones in combined arms formations (Project "Archangel" 2023). Their low cost, general ubiquity and ease of use make them a perfect expendable tactical system that will continue to have an impact on this war throughout 2024 and beyond.

7 Swarming and AI Applications

Finally, the war in Ukraine is a testing ground for artificial intelligence as a military tool in active peer combat. With AI as a data analysis tool already applied by Ukrainian forces, such applications may dictate how this technology will evolve in subsequent years of heavier R&D efforts by all sides (Ignatius 2022). Another key investment area is swarming for greater battlefield impact. The Russian MOD is no stranger to studying such group use applications for UAVs and its ground and maritime drones, although the full extent of this research is unclear, as is the Russian military's ability to field such concepts in the near future. At this point, the words "swarm" and "group" are used interchangeably by the Russia-based military analysts and experts, creating a certain degree of confusion when discussing actual UAV flight characteristics and strike potential (Overlookers 2023). Both Russian and Ukrainian forces are launching drones in waves and groups (UAVs 2022),with each drone piloted by its own operator, but neither is close yet to an actual swarm, which implies a more intelligent cooperation, independent participant action and continuous communication among swarm members (see chapter by Zachary Kallenborn).

Prior to the war, the Russian MOD actively funded the development of such UAV swarming applications, and the first military trials apparently took place in 2020 (Tass 2020). Swarming and artificial intelligence research, development, testing and evaluation (RDT&E) was pursued for years by Russian military-industrial enterprises and research centers (Zakvasin 2019). With swarming concepts worldwide in development at an ever-increasing pace, the Russian MOD's investment in this area is a logical strategy given other major power's attention to the topic. However, the Kremlin's actual results from such experimentation may not be revealed for some time given the lack of empirical examples of drone hardware and testing. This runs contrary to the US and Chinese efforts that now include multiple swarm tests with dozens, hundreds and thousands of interlinked drone systems (Gallagher 2017; Aubourg 2022). At the same time, the Russian military may build on its experience in launching waves and groups of Geran-2 and Geran-1 drones against Ukrainian targets as a base line for the

drone swarm command and control architecture; or it can build on group use of quadcopters or FPV drones to develop a swarming concept for small drones and UAVs (UAVs 2022). Likewise, the Russian military is attempting to build on its experience with Lancet-3 drone use to develop this drone's next generation as a swarming UAV in Ukraine (UAV Operator Chronicles 2023).

Artificial intelligence is a major topic of discussion among military establishments as a significant enabler for command and control, decision-making, data collection and analysis (Ignatius 2022). AI as a key tool in image recognition, computer vision and machine learning was publicly discussed by the Russian MOD for years, and the country's military establishment maintains interest in developing solutions based on such principles (RIA 2018). For example, the Russian MOD is considering equipping its reconnaissance and strike drones with a digital catalog to automatically recognize NATO military equipment (CNA 2022). Specifically, this development includes neural network learning algorithms (an AI method that teaches computers to process data in a way that is inspired by the human brain) that can identify such military equipment samples in a wide variety of environmental conditions (CNA 2022).

These and other AI-related developments and concepts are logical consequences of the Russian military's growing need for UAVs that can perform with precision in an ever-increasing complexity of Ukraine combat environment. Multiple Russian defense enterprises, research centers, and military departments are likely to continue their research and development of AI-enabled solutions well past 2024, since the nation's military is increasingly hungry for a technological breakthrough as an advantage against the Ukrainian military.

8 Conclusion

Russia's invasion of Ukraine and the subsequent mass-scale use of different uncrewed aerial technologies are pushing the country's defense sector to come up with new and innovative solutions, and to build on its experience with domestic and imported technologies. The patterns outlined above will define how the Russian military will use and develop drones for a possibly lengthy war against Ukraine. With an active debate on the future of the Russian drone force, many Russia-based commentators and experts think this particular conflict is the last one where strictly commercial drones can be used at such a scale, since they are vulnerable and susceptible to air defense tactics (Game of Drones 2022a). To many, the post-Ukraine war combat future belongs to compact short-range drones used at the tactical levels; loitering munitions for mid to long-range strikes; and a mix of reconnaissance, guidance, combat and logistics drones for a range of mission sets (Game of Drones 2022a).

Much of Russian military's drone development will also be defined by the nation's defense industry and its ability to maintain production rates through 2024 and beyond

as the international sanctions and the state of the domestic economy are prompting a search for new solutions, alliances, supply chains and technological adaptations (Vergun 2022). Russia's growing reliance on Iranian military technology on one hand, and the continuing dependence on imported components for drone manufacturing on the other, will likewise impact the size, scale, composition, and sophistication of the nation's drone fleet. At the same time, commercial drone technologies may be developed and incorporated at a much quicker pace than military drones. Its notable that commercial drone use proliferated so quickly that the Russian military establishment is still trying to grasp its significance and adapt, given mass-scale development and delivery of cheap, expendable FPV drones by a multitude of volunteer efforts, and the frontline forces' ready use of this UAV technology (Project "Archangel" 2023).

Likewise, the Russian drone industry, used to the development and manufacture of heavier military-grade platforms, appears unprepared to meet massive demands for much cheaper, expendable, FPV-type drone technology. While commercial DJI-type quadcopters grabbed headlines in 2022, by 2023 it was the even cheaper and less sophisticated FPV drone that was utilized with great frequency and success by both sides. With the rapid evolution of countermeasures against such threats, a potentially new aerial drone solution may evolve just as rapidly in the near future, pushed along by the military needs and the volunteer and civilian technological prowess adopting the latest technology for this war. The blueprint for current and future drone warfare is written in Ukraine on a daily basis, with all belligerents seeking an edge in aerial drone technology. The Russian military, despite its significant setbacks, is nonetheless learning and adapting, and its ability to integrate different UAV and drone classes may determine the outcome of this war and the subsequent evolution of military uncrewed aerial technologies across its armed forces.

Seminar Questions

1. What are the main points for Russian UAV development and application in Ukraine?
2. What is the impact of commercial UAV technology in this war?
3. How is Russia's loitering munitions use adapting to combat?
4. What are the future patterns for the Russian UAV use in Ukraine?

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21 Europe's Military Drone Problem

Abstract: This chapter looks at the proliferation of advanced military drones among European countries. While security and strategic studies scholars and practitioners debate vigorously the legal and ethical aspects of drone strikes and lethal autonomous weapons, or the consequences of drone proliferation for international stability, this chapter sheds light on the often invisible role of NATO and the EU in helping their members adopt emerging drone technology. This chapter first engages with the capacity-based theories of military technology diffusion to show why European countries have been having immense problems with developing their own advanced drones in the past 20 years. Second, it examines the ways and extent to which NATO and the EU help countries overcome the platform and adoption challenges posed by advanced military drones. The good news is that international organizations help countries not only adopt new technologies but also invest in their development. The bad news is that despite these institutional resources, the proliferation of advanced drones in Europe has been paltry, to the large extent due to the divergent national strategic needs and defense industry strictures, which then translate into dissimilar technical solutions. The war in Ukraine, however, quickly showed that Europeans are procuring drones for the wars of yesterday. The European thinking about drones – both lethal and supporting – may soon change with the lessons learned from Ukrainians on the usefulness of drone diversity in military operations.

Keywords: Advanced drones, military technology diffusion, capacity-based theory, drone proliferation, NATO, EU

1 Introduction

Only a handful of European countries operate advanced Class III drones. These are as large as a conventional fighter jet, operated through satellite communication links, and come in two variants: medium-altitude, long-endurance (MALE) and high-altitude, long-endurance (HALE). Advanced drones have a wide operational range, fly longer, and carry heavier payloads, either sensors (Intelligence, surveillance and reconnaissance [ISR] drones) or weapons (strike-capable drones). These large drones have enabled European armed forces to conduct persistent surveillance over the Mediterranean, strike terrorists in the Middle East and Sub-Saharan Africa, monitor Russian incursions in the Baltic and Black Sea regions, support the United Nations mission in Mali, and police the EU's borders.

However, individual European countries have had immense problems developing their own Class III drones and are still lacking a made-in-Europe advanced drone plat-

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form. Despite the large number of resources invested in research and development projects over the past 20 years, European countries have been struggling to move from the experimental development of demonstrators and prototypes into the operational and production stage (Kunertova 2021).

At the same time, a fleet of five HALE drones operate as part of NATO's Alliance Ground Surveillance system, the EU's European Defence Agency (EDA) offers a MALE drone training simulator, and the Frontex agency flies its own large drones to monitor EU borders. The popular claim that drone capability is easy and inexpensive to develop or purchase has already been nuanced by studies of the platform and adoption challenges (Sayler 2015; Gilli and Gilli 2016). While smaller drones have become commercialized and ubiquitous, advanced uncrewed systems entail a very complex technological development (platform challenge) and require teams of highly skilled personnel and infrastructure to operate them (adoption challenge). Yet, the research on military technology diffusion has not systematically analyzed the role of international organizations in supporting and facilitating cooperative solutions to emerging technology problems and capability shortfalls with a high price tag.

This chapter investigates the often silent role that NATO and the EU have played in the drone proliferation dynamics in Europe and argues that both organizations have become a significant part of the solution to the European drone problem. It puts forward that the NATO's military logic and the EU's market logic can channel national capability development and acquisition efforts by sponsoring and supporting research, technology, and development projects, shaping requirements and national regulations, providing expertise, socializing communities of experts, and facilitating multinational solutions. Both NATO and the EU help countries overcome the platform and adoption challenges posed particularly by advanced uncrewed systems.

However, despite persistent efforts from different EU member states and EU institutions, the European drone is still not a reality after almost two decades of development endeavors. All advanced drones operated by European countries come from either the United States or Israel (except for Ukraine, which uses Turkish drones). The primary cause of the European delay in drones today lies in divergent strategic needs and industrial rivalries in the defense sector that largely respect national borders. No multinational institutional mechanism can properly address this conundrum. Without leadership from national governments, power politics and competing interests continue to threaten financial sustainability and cross-border technological cooperation.

This chapter concludes with the future challenges European countries face when it comes to developing and operating advanced drones and discusses how the war in Ukraine is likely to change European thinking about armed drones and drone proliferation.

2 How Military Technology Spreads

Theories of military technology diffusion and military innovation have looked at the proliferation of military drones through three main themes: (a) the impact of armed drones on international stability; (b) motives to develop and/or acquire drones; and (c) factors that either constrain or enable drone proliferation. This chapter subscribes to the last group and suggests the institutionalized security architecture and the role of organizations in the proliferation processes are the enabling factors that have become typical for the European environment.

Theories of military technology diffusion (see Table 21.1) identify security benefits and regime type, which form the demand-side (the interest in procuring drones), while the condition of national economy and technological-industrial base represent the supply-side (the capacity to develop and operate drones).

Table 21.1: Military technology diffusion theories.

Theory	Enabling/constraining factors
Interest-based (willingness, demand-side)	– Threat environment, strategic and political interests (security benefits) – Domestic institutions – Emulation, drone envy
Capacity-based (opportunity, supply-side)	**Platform challenge** (technology and technological capacity): – Dependence on technological availability abroad – Limited defense-industrial base – Vested interests (industrial monopoly/oligopoly, corporate obstacles, national industrial politics)
	Adoption challenge (organizational and infrastructural constraints): – Lack of know-how – Legacy systems – Distributional implications

The interest-based, demand-side theories argue that states procure drones to meet their political and strategic interests and to fulfill their military operational needs, especially when they face security threats such as potential border disputes, migration, and terrorism (McDonald 2018, 9). Domestic political institutions can further shape incentives to procure drones. In the Western democratic context, the elected political elites are risk-averse and can support the acquisition of drones with the view to keep troops out of harm and to decrease the cost of military operations.[1] At the same time, public opinion and domestic institutions can block the possibility of arming drones or limit their

1 However, some refute that casualty shyness plays a triggering role in the development of drones (Weiss 2017, 189).

use in offensive campaigns. For instance, in Germany, disagreement among the political parties ruled out using armed drones altogether (until Putin invaded Ukraine in 2022). In contrast, autocratic leaders have more interest in increasing persecution and surveillance to control their own populations in the form of "remote control repression" (Cronin 2013).

Another motive for procuring drones is the emulation of demonstrated military capabilities and practices in other armed forces, dictated by security competition and threat urgency (Zenko and Kreps 2014). The motive can also be as simple as drone envy – everyone wants to have a new shiny toy. For instance, the increasingly dronified American strategy since 2001 has sparked the high demand for military drones elsewhere in the world (Bergen and Rowland 2014). The Afghanistan experience with American drones in the mid-2000s continues to shape acquisition practices in European countries to this day.

There are two ways of generating military power: develop a new military technology or adopt an already existing and proven technology from another state. The second type of the family of military technology diffusion theories, the capacity-based or supply-side theories, posits that the level of sophistication influences how fast the technology will spread. Thus, the actor's capacity to develop and effectively field drone technology is the central factor in supply-side arguments, suggesting that organizational and financial constraints may limit the types of drones that countries can build and operate.

Often, the military technology proliferation literature flattens the differences between various types of drones. As the capacity-based theory shows, this is problematic, since drones range from small spy gadgets that can fly for 20 minutes and fit in the palm of one's hand (Class I) to large surveillance drones that are able to stay aloft the whole day and scan theater-wide areas and even carry missiles (Class III).

This points to the importance of platform and adoption challenges that can considerably slow down the proliferation of advanced drones. The platform challenge concerns designing, developing, and manufacturing weapons systems. This often requires specific industrial and scientific capabilities that cannot be easily borrowed from other fields. This challenge is related to both technology (the nature of the systems' capabilities) and technological capacity (expertise and experience of the manufacturer). The assumption that drones are "easy and cheap to produce" does not hold – even though ISR drones have many commercial and dual-use components, countries cannot just transpose "the knowledge, workforce, laboratories, and testing and production facilities of other industries" (Gilli and Gilli 2016, 58).

The adoption challenge warns that the organizational and infrastructural requirements can severely affect the operational effectiveness of weapons systems. The organizational requirements concern developing new practices and doctrines and defining new techniques, tactics, and procedures. The infrastructural requirements include information technology, communication systems (satellites, communication relay platforms, and tactical datalinks) and the ground support of other systems. Although the

further development of sensors and artificial intelligence-powered computation will reduce drones' reliance on satellite and human operators (Grand-Clément and Bajon 2022), drones are not stand-alone platforms and are far from being uncrewed.

Even though states can bypass the technological difficulties of developing their own drones by importing them from abroad, technological availability does not eliminate the adoption challenge. Operating advanced drones still requires appropriate infrastructure and trained personnel. The employment of one high-end ISR drone like the MQ-9 Reaper or the RQ-4 Global Hawk implies a large team of highly skilled personnel in communications, computers, and software. Such resources are scarce, entail years of practice, education, and expensive training facilities. Thus, the most advanced drones require intense logistical support and global bandwidth, together with important doctrinal and organizational transformation (Horowitz, Kreps, Fuhrmann 2016, 36).

3 The Dronification of European Militaries

The procurement patterns in European countries confirm the hypotheses of interest and capacity-based theories. Strategic interests, persistent security threats, and the adoption challenge explain the small number of Class III operators, while the platform challenge sheds light on the inability to develop a competitive and operational MALE platform in Europe.

Only countries facing constant security threats have acquired advanced drones. Currently 11 European countries operate or are at various stages in the acquisition process of MALE drones: France, Germany, Greece, Italy, the United Kingdom, Belgium, the Netherlands, Spain, Switzerland, Ukraine, and Poland. While only three countries use Israeli drones (Germany and Greece operate Heron; Switzerland has acquired Hermes 900), the rest operate versions of MQ-9 Reaper made by the American company General Atomics. Until recently, only the United Kingdom and France armed their Reapers and deployed them in drone strike operations. Furthermore, no European country alone has been able to operate the largest HALE drones. The American RQ-4 Global Hawk, and its maritime equivalent MQ-4C Triton, produced by Northrop Grumman, remains the only operational HALE platform in the world.

European countries have been lagging behind the United States in developing and operating military drones by some 15–20 years (Gilli and Gilli 2018, 754). If the major European multinational project developing the first indigenous MALE drone delivers an operational Eurodrone in 2029 as planned, the American advanced drones will have been in service for already 30 years.

Interest-based reasoning in countries like France, Germany, Italy, Belgium, Spain, Greece, or the United Kingdom points to these countries need for an operational MALE drone to perform ISR and ISTAR (intelligence, surveillance, target acquisition,

and reconnaissance) missions in Mali, Afghanistan, Iraq, and Syria; to fight terrorism and illegal migration in the Mediterranean; or to perform surveillance of the European borders.

To counter the platform challenge, European countries have developed various procurement practices to obtain foreign MALE drones. First, they purchase them off-the-shelf (MQ-9 Reaper: United Kingdom, France, Netherlands, Spain, Poland; Hermes 900: Switzerland); second, they adapt foreign platforms to national requirements (French Harfang based on Israeli Heron; British Protector and Belgian SkyGuardian both based on MQ-9); or third, they lease instead of buy them (Germany and Greece leased Israeli Heron). European approaches to counter the adoption challenge have yielded various success rates (see next section).

The more advanced the drone platform, the more support given to the capacity-based theories. Platform and adoption challenges show that the proliferation of drones is not only a function of strategic needs and the security environment, but also of the ability to overcome the organizational and financial constraints. Importantly, interest and capacity-based theories of military technology diffusion are individually insufficient to explain the proliferation outcome. For instance, the analysis of the drone adoption policy should combine systemic incentives and organizational capital with financial constraints (Fuhrmann and Horowitz 2017). The history of the development of drones in the United States and Israel reveals that enduring security threats form state interests in acquiring drones, while state capacity to supply technology and technical progress determines the adoption and operational effectiveness of drones. In addition, the process of developing and acquiring drones can be constrained by idiosyncratic distributional struggles, vested interests, and legacy systems (Weiss 2017).

4 Institutional Drone Fabric

International organizations can play a non-negligible role in spreading military technology. The proliferation dynamics on the European dronescape reveal one important factor missing on this list of military technology diffusion theories: the role of the two most important security institutions in Europe – NATO and the EU – in helping countries overcome both platform and adoption challenges related to advanced military drones.

Both organizations have developed important mechanisms to provide their members with various enabling services, networking fora, and funding opportunities to facilitate the adoption of military technology. On the one hand, they address the platform challenge through generating technological expertise and know-how, offering research funds, procurement support, or even acquiring the lacking capabilities on behalf of member countries. On the other hand, they can ease the adoption challenge by develop-

ing operational standards and doctrines, regulating airspace integration, supporting procurement, and facilitating staff training and maintenance support (see Table 21.2).

Each has developed its own distinct institutional logic that derives from the institution's mandate and tools. While NATO is driven by defense interests and military operational logic, the EU follows economic interests and market logic. NATO is strong in identifying capability requirements based on operational needs and military efficiency, providing military expertise, and improving interoperability. Since the adoption of the 2016 EU Global Strategy, the EU has developed financial and regulatory tools to strengthen the European defense technological and industrial base at the EU level and to create a common European drone market.

Importantly, both NATO and the EU have created their own international armaments cooperation organizations – the NATO Support and Procurement Agency (NSPA) and the EU's EDA – to coordinate weapons procurement and manage defense-industrial relations (Kurc and Oktay 2018). They both not only facilitate information sharing, but also actively generate knowledge and expertise that is further shared at the national level among their member countries.

NATO focuses on military operational needs to generate military expertise and interoperability. As to the platform challenge, NATO develops interoperable technical military standards for military drones. The Joint Capability Group on Unmanned Aircraft Systems (JCGUAS) represents a focal point for all standardization work on drones (Mayer 2017). The Alliance Ground Surveillance (AGS) system is the most visible aspect of NATO's contribution to drone technology diffusion. Through AGS NATO provides its members with a fleet of five large "Phoenix" drones, based on RQ-4D Global Hawks Block 40 and stationed at the Sigonella air base in Italy, to perform wide-area terrestrial and maritime surveillance. AGS is thus a prime example of how NATO has helped countries to overcome financial difficulties (15 countries, one budget) and make it possible to collectively acquire a fleet of HALE drones by grouping the interested countries together institutionally. Smaller countries would otherwise not have the possibility to acquire the experience and skills required to operate this largest surveillance drone.

In addition, the NSPA assists countries in the procurement process of foreign drone platforms. Through close dialogue with industry, the Alliance also funds conceptual research and technology studies to generate technical expertise. NATO's Science and Technology Organization maintains a community of more than 5,000 subject-matter experts from academia and industry and keeps drones among its research priorities.

NATO addressed the adoption challenge mainly through the development of operational standards and doctrines, including the creation of a joint ISR architecture, and through providing procurement support for the maintenance and upgrade of drone systems. In addition, NATO liaises with EUROCONTROL for technical and operational collaboration to enable its AGS fleet to fly in European airspace.

The EU's market-oriented logic concentrates on developing financial and regulatory tools to create a globally competitive European drone market, improve the Euro-

Table 21.2: Institutional suppliers of military drones in Europe.

	NATO	EU
Platform challenge	– Acquisition of strategic HALE drone capability (AGS) – Procurement support (NSPA) – Industrial studies – Networking of scientific community (STO)	– Funding R&T and R&D projects through the European Defense Fund and its preparatory phases – Financial and administrative contribution to the Eurodrone project – Acquisition of MALE surveillance drones (Frontex)
Adoption challenge	– Military expertise: STANAGs for all types of drones; JISR – Sharing of good practices – Maintenance support, upgrade (NSPA) – Air traffic management (together with EUROCONTROL)	– Air traffic integration of drones, regulation of the civilian drone market (led by the European Commission) – Training support (EDA) – Enabling capabilities, e.g., detect and avoid anti-collision systems (EDA) – Custodian of MALE community (EDA)

pean Defence Technological and Industrial Base (EDTIB), and decrease European dependence on the American and Israeli uncrewed systems. The EU is helping its member states to overcome the platform challenge by funding innovative research on drone technology. It has created financial opportunities for its members and their industry by streamlining European defense spending into collaborative projects.

The European Commission has a long record of providing research funds for drone technology, including dual-use, with an objective to build “a common EU security and defense research and development culture” (Martins and Küsters 2018, 278). However, several scholars and activists have pointed to a problematic militarized nature of EU R&D funding and warned against an excessive reliance on drones in surveillance (Hayes, Jones, and Toepfer 2014, 81; Csernatoni 2018). This problematic hidden practice of funding dual-use drone technology through EU public research funds was eliminated when the European Commission created the European Defence Fund (EDF) in 2017 to directly support projects in the defense domain. Under the Multiannual Financial Framework 2021–2027, however, the first EDF budget got slashed from the expected of €13 billion to €8 billion, largely due to the EU’s efforts to recover from the public health crisis caused by the COVID-19 pandemic.

The most important Eurodrone project, however, was launched in 2015. It aims to develop a European equivalent of the American MQ-9 drone, and is planned to be operational by 2029. Within the framework of the Organisation for Joint Armament Cooperation, the main industry participants Airbus (Germany in lead, Spain), Dassault (France), and Leonardo (Italy) work together to develop a purely European MALE drone capability to enhance European industrial autonomy, create a market of contractors in Europe, and operate independently from foreign technology. To highlight

its prominence, Eurodrone has also been selected as one of the EU's permanent structured cooperation (PESCO) projects, another EU mechanism promoting multinational defense cooperation and received extra 100 million EUR in funding from the EDF.

Lastly, in 2021 the EU border police agency Frontex purchased its own MALE drones from Israel to patrol the EU's borders – the first EU body to do so – on behalf of Frontex member countries (the EU usually rent military capabilities from its member states).

To ease the adoption challenge, the EU contributes to the development of enabling technologies, such as air traffic integration and training simulators, and facilitates the sharing of best practices among European MALE drone operators. The European Commission's "Single European Sky" (SES) initiative, launched in 2010, works to modernize and simplify European air traffic management, including the EDA's work on the air traffic integration of military drones, which makes it possible for the military to voice their requirements for operating drones in Europe (Lavallée 2017). The EDA also provides support to research and development projects related to drone-enabling technology, such as detect and avoid sensors. The EDA has also become a custodian of the European MALE RPAS Community, which has been building a shared operational culture among MALE drone-capable countries: France, Germany, Greece, Spain, Italy, the Netherlands, and Poland. One of its recent milestones includes the development of the MALE RPAS Training Technology Demonstrator, distributed to European military schools in ten member states.

5 So Where Are European-Made Drones?

NATO and the EU answer the demand from their respective member countries. While European militaries were not interested in drone technology in the late 1990s, and later started paying concerned and critical attention to the humanitarian consequences of targeted killing (Paulussen, Dorsey, and Boutin 2016; Dorsey and Amaral 2021), shrunk financial resources delayed investment in drones in the 2000s. In addition, Europeans underestimated the sophistication of advance drone platforms, which forced them to procure drones from the United States and Israel. The combination of the technological complexity of Class III drones, structural constraints on the European defense market, and divergent strategic needs keep a made-in-Europe drone solution out of reach.

The initial delay in the adoption of both ISR and armed drones in the mid-1990s and the 2000s was mainly caused by the lack of interest as neither political nor military authorities believed in this new technology. Despite the experimental use of drones in Kosovo and Libya as a testing ground, European armed forces operated only small and tactical drones (Class I and II). This attitude changed at the end of the

2000s with the experience in Afghanistan, where European military authorities could observe that drones did make the fight against terrorism more effective.

The popular use of, and dependence on, American and Israeli drones has resulted from the fact that even advanced European economies and technological-industrial bases have struggled to develop advanced drones on their own. Although Europeans do have the industrial capacity and expertise to produce a full spectrum of military drone capabilities, the development of advanced drones is a very time-consuming and expensive process in terms of both financial and expert human resources (Horowitz 2010). There is a significant difference between developing prototypes (research and experimentation) and manufacturing reliable platforms. While prototypes are easily built, and there have indeed been many projects of this kind in Europe, turning them into operational products takes political will and substantial investments.

The rivalry among major European defense aerospace industrial players (Airbus, Dassault, Leonardo, and BAE Systems) has contributed to delaying advanced drone military technology in Europe. Despite many past bilateral and multilateral projects that intended to develop indigenous European MALE capability (Advanced UAV, Talarion, Telemos, or Barracuda), the United Kingdom, France, Germany, Italy, and Spain have not moved from the experimentation to operational implementation stage just yet.

The absence of European large drone operators is related to another important factor: aviation safety in the congested European airspace. The only attempt at developing a HALE drone was the German EuroHawk program. Based on the American RQ-4B Global Hawk, EuroHawk was supposed to provide signal intelligence capabilities. It was canceled in 2013 due to flight certification problems (Defense Industry Daily 2019). In an eerie déjà-vu, the following German PEGASUS project, which entailed the procurement of the American Triton drone, was canceled at the beginning of 2020 due to the lack of sufficient flight certification. The German government has opted for a manned platform instead and abandoned the plans to acquire a HALE drone (Lake 2020). Similarly, the Swiss fleet of Hermes 900 drones remained on the ground for months after their delivery due to missing certification and a de-icing system to enable them to fly in Swiss airspace and over the Alps.

Overall, the evidence suggests that European armed forces will remain locked into advanced foreign drone platforms in the short to mid-term, as it is likely that the future European MALE drone alternative will struggle in a well-established infrastructure network of American MQ-9 and Israeli Heron/Hermes 900 users. Three countries participating in the Eurodrone endeavor already use US MQ-9s, making Germany the largest client for Eurodrone. Meanwhile, the French Air Force has formed a second Reaper squadron and the Royal Air Force is acquiring two dozen Protectors.

Developing new technologies and turning them into operational military capabilities is a long and complex process that often runs into funding, engineering, and bureaucratic problems. Yet the Europeans mastering uncrewed aerial technology would contribute to the EU's aim of technological sovereignty and building a robust defense industrial base.

International organizations can alleviate some issues. Although national capability development is a responsibility of each member country, several of these national efforts rely on NATO's lead and the support of NATO agencies, as well as on the EU's capability development priorities, which in turn financially incentivize countries to collaborate on closing the capability shortfalls. However, they are not immune to the realities of power politics.

Although both NATO and the EU can mobilize their expert machineries to guide and support their member countries towards developing effective drone capabilities and ensure their interoperability, they are only enablers, not a panacea for overcoming platform and adoption challenges. First, although defense has become a new EU industrial policy aiming to improve European defense capabilities on a multinational basis, the EU in fact deals with 27 overlapping national defense markets, not a single defense technological and industrial base. Second, neither of the two institutions has the capacity and authority to verify whether the agreed standards are properly implemented, because certifying military equipment remains a national responsibility. Third, homegrown development of advanced drone capability suffers from strictures. European countries have divergent national strategic interests and the structural condition of the European aerospace defense sector is still characterized by exclusion-inclusion dynamics perpetrated by major industrial players (Dassault, Airbus, BAE Systems, and Leonardo). Pouring more funding into defense and developing golden but non-binding standards do not automatically overcome the strategic immaturity of European military emancipation.

Participants in the joint – and often dysfunctional – armament projects need first to align their strategic requirements to deliver a European drone solution. With multiple projects running at the same time and working on the same capability, incentivizing collaboration at the European level is not enough when national politics and self-interest prevail. The guiding criteria for getting the cooperative arrangements right should include military performance and costs, rather than parochial interests. The remedies can include dividing industrial ownership and equitable workshares by squaring fairness with effectiveness; making the know-how sharing transparent; creating a Europe-wide network of contractors; and agreeing on the export rules of the participating countries. This can smooth out arrangements so that multinational armament projects deliver.

6 Conclusions and the War in Ukraine

Both NATO and the EU can support European countries' acquisition of a critical drone capability that can go beyond national resources by offering expertise, money, and assets. From the point of view of the capacity-based military technology diffusion theories, both organizations are intensively involved in supporting national capability

development, providing their member countries with more than just discussion fora for knowledge sharing. This includes addressing a lack of technology and technological capacity on the one hand and industrial, organizational, and infrastructural difficulties on the other hand. In addition, countries' choice of a specific drone platform is influenced by the institution membership, like the legacy of American drones manifests among European operators. No EU or NATO country bought Chinese drones, despite their unconstrained export and favorable price on the global drone market (Woodhams 2018).

Paradoxically, the ongoing war in Ukraine has quickly shown that Europeans have been buying drones for their yesterday's conflicts – to conduct counterterrorism operations overseas in asymmetric conflicts, removing humans from the front line. While European multimillion efforts to decrease dependence on foreign drone technology have so far largely failed, Russia's war in Ukraine have showcased inexpensive commercial drones achieving important tactical effects for a fraction of the cost.

Large drones deployed in air operations are most useful in uncontested airspace over asymmetric conflict zones thanks to their long endurance enabling surveillance and remote strikes. Currently 34 countries possess large armed drones worldwide (Cole 2023). These large uncrewed systems become fragile in an active shooting war in which no side has control of the sky (Calcara et al. 2022). Large armed drones are being supplemented by a widening spectrum of lethal drones, which includes not only large drones armed with missiles, but also grenade-carrying alternatives to military drones, loitering munition, and small reconnaissance drones in their target acquisition role. Changing public perceptions have made armed drones more politically feasible. Once decried as flying assassination robots conducting not-so-surgical strikes, as well as ethically and legally disputable executions in 2000s–2010s, in Ukraine they have become an unavoidable part of conventional warfare in a declared warzone.

While some believe that "a radical restructuring of national armed forces towards cheap and small robotic platforms is unwarranted" (Gilli 2022), most analysts put forward that those small commercial drones have accelerated the pace of artillery and can provide situational awareness down to the level of the platoon soldier. This constitutes a significant evolutionary change in terms of their enabling functions, not as an extension of airpower (Page 2022). The drone experience in Ukraine shows that small, cheap, and low-tech drones deployed in huge numbers can make a difference in either military or psychological terms.

The war in Ukraine is changing European thinking about armed drones. This means above all that European countries need to adopt a wholistic approach to drones that would include not only large armed/surveillance drones as a legacy of counterterrorism, but also integrate small drone scouts and bomb droppers serving land forces, as well as effective anti-drone defenses (Rogers and Kunertova 2022).

Seminar Questions

1. Which factors can explain the global proliferation of drone technology?
2. Why do European countries keep having difficulties with developing Class III drones?
3. How can international organizations help their members adopt new technologies?
4. Operating thousands of drones over the battlefield, how have Ukraine overcome the platform and adoption challenges?

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Kerry Chávez and Ori Swed

22 Violent Nonstate Exploitation of Commercial Drones

Abstract: In the last decade, many violent nonstate actors have attained crude airpower with homemade, commercial and, in some cases, military-grade drones. While early adoption was constrained to groups with higher capacity, around 2013 the rapid advancement of commercial unmanned aerial system technology enabled a broad, diverse, and growing range of militant groups to harness them. Now, groups of manifold goals – terrorists, insurgents, rebels, cartels, criminal syndicates, extremists – use them to advance their agendas. The phenomenon is as geographically spread as ideologically, occurring in every region except Antarctica. The reason for this surge in malign drone use mirrors those of licit nonstate users: commercial drones are feasible and effective. As the industry expanded, these platforms became increasingly affordable and sophisticated. Flexible for multiuse functions, they can replace or reduce risk to manpower, yield intelligence to support operations, and serve as weapons from an aerial vantage point where many targets have not developed defensive measures. Each of these factors is critical for violent nonstate actors vying against stronger states and other nonstate competitors. The most common application is for intelligence, surveillance, and reconnaissance. Militant groups also use them for target acquisition, propaganda, to disrupt enemy forces and broader political and economic processes, and for weaponized attacks. Already a security concern in several venues, we anticipate that the malign drone threat will grow in use, innovation, and complexity. We conclude with some prescriptions, emphasizing early mitigation, technological solutions, and training.

Keywords: Unmanned aerial vehicles, drones, violent nonstate actors, terrorism, innovation, international security

In the last decade, violent nonstate actors (VNSAs)[1] have attained reliable, low-end airpower[2] with the maturation of commercial drone technology. It has, does, and increasingly will have meaningful implications for militaries and security providers as they face a greater volume and variety of threats from above. In this chapter, we survey the causes, characteristics, and consequences of this recent development. To build a mental architecture and common vocabulary, we address some key, structuring questions: *who* is using drones, *where* are VNSAs fielding them, *why* drones specifi-

1 VNSAs are organizations with political goals that use hostile force outside of sanctioned state apparatuses.

2 Compared to exquisite aerial platforms that states field, such as fighter jets and heavy drones, low-end refers to systems far lesser in cost, functionality, sophistication, and ruggedness.

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cally, *when* did the phenomenon emerge and evolve, *how* are VNSAs using them, and *what* are some potential implications and solutions?

1 Who?

A number of actors use unmanned aerial vehicles (UAVs), or drones, across the world. This capacity was long exclusive to powerful nations, requiring advanced and intensive technical skills, infrastructure, and financial investment (Joshi and Stein 2013). Things have changed. The commercialization of drone technologies has rendered them affordable and accessible, yet still advanced. As of 2022, an estimated 113 nations (58%) have active military drone programs (Gettinger 2020). Commercial UAVs are even more abundant, globally generating US $22.5B in 2020 and expected to double in the next four years (Schroth 2020). Though there is concern about state abuse and civilian irresponsibility or error, a significant security threat stems from the malign use of drones by VNSAs. Several groups are harnessing drones to augment their forces, offset and circumvent security measures, and advance their agendas. Our running tally of verified VNSA drone users exceeds 65 diverse organizations, ranging from gangs and drug cartels, separatists like myriad coalitions in Myanmar, insurgents like the Kurdistan Worker's Party or any number of Syrian rebel groups, state-sponsored militants like the Badr Brigades in Iraq, and pseudo-state militaries like the Kurdish Peshmerga (Chávez and Swed 2022b). Given the challenges of dynamic data collection and our conscientious criteria for including groups in this list, the real number is doubtlessly much higher.

2 Where?

VNSA drone use is global. The only region of the world where illicit groups do not field drones is Antarctica. Taking off and most recurrent in the Middle East, terrorist drone adoption has diffused to Africa; Central, South and East Asia and the Pacific; Latin and South America; and to North America and Europe (Rogers 2019). Of late in the last, the copious and creative use of hobbyist and state-donated drones by Ukrainian resistance fighters has captured much media attention and many imaginations despite that they have been used in the Donbas since at least 2014 (Crumley 2022). Although possessing advanced military drones, that Ukraine's 'mosquito' fleet composed of weaponized off-the-shelf platforms is being used more frequently and to great effect against a strong state demonstrates their utility and forebodes about future wars (Dlugy 2022).

3 Why?

To understand why drones are appealing and impacting for VNSAs, it is helpful to consider these actors' incentives and constraints. To mount a viable campaign against a local or state power, they must have manpower, weapons, and information. Being underdogs in their operating arenas, they are usually outnumbered, outgunned, and under-resourced. Yet it is risky for anyone to join or supply them because if caught, one is likely to face serious consequences such as criminal penalties, social stigmas and pejorative marks, and loss of economic opportunities or even sanctions. Thus, it is difficult for armed nonstate organizations to amass an army and arsenal large enough to survive much less compete against states. This is a root reason why VNSAs use strategies like terrorism, insurgency, and civilian violence – to deflect the brute force of stronger militaries, to draw attention to their cause, to project power and signal resolve despite appearances (Arreguín-Toft 2001; Kydd and Walter 2006). It is also a key reason armed nonstate groups innovate clever ways to close the parity gap. Clever means two things in the asymmetric context in which VNSAs operate: feasible and effective. Commercial drones are both.

First and foremost, purchasing off-the-shelf UAVs is feasible for most if not all actors. They are affordable, broadly accessible, and user-friendly. Hobbyist drones are the cheapest, costing anywhere from less than to a few hundred dollars. In military/security contexts, this is comparable to a small supply of one-use, expendable ammunition (Hammes 2013). Industry-specific drones designed for more specialized or heavy-duty missions (i.e., agriculture, energy, mining) run higher but are still attainable for many groups. Commercial drones are also accessible from a variety of vendors. Since it is difficult to determine a buyer's intent upfront (a glorified selfie stick, a business investment, or a makeshift loitering munition?), there are few regulations limiting purchase. Even with efforts to obstruct supply to malign users, the dense and layered global market offers ample alternatives (Rogers and Kunertova 2022). In addition, current generation drones have been optimized and autonomized so that users of all stripes can fly them (Rogers 2021). They can take off and land vertically, sense and avoid obstacles, follow assigned targets, operate beyond line-of-sight, and even execute complex pre-programmed routes (including in swarms) from a base station or mobile phone.

Beyond feasibility, commercial drones are effective for VNSAs' goals. They augment their power in three ways necessary to sustainably contend against stronger opponents – manpower, weapons, and information. In fact, their versatility enables a savvy group to gain all of these with a single UAV platform. First, VNSAs multiply their manpower via propaganda generation. They use drones to publish striking cinematography of operational successes, simple overflight to signal vertical sovereignty, and rousing recruiting materials (Archambault and Veilleux-Lepage 2020). Off-the-shelf drones can also be weaponized with bomblets, as loitering munitions that explode upon guided impact with a target, or even as spotters to improve target acquisi-

tion for other weapons (Rassler 2016; Ball 2017). Finally, they enhance information by performing intelligence, surveillance, and reconnaissance (ISR) activities at lower risk to operators' lives, in sensitive places and at reaches that militants cannot go, and at a novel vantage point. In addition to aiding militants during planning stages, they are also useful in real time combat to coordinate foot soldiers' movements to greatest effect (Chávez and Swed 2021). In short, being low-cost and high-utility, drones endow resource-constrained VNSAs fighting against strong foes with a significant boost (Sander 2016).

4 When?

Terrorists have had their eye on aerial capabilities for some time, using balloons, rockets, and hijacked airplanes when possible. Although the first attempt to use UAVs in an attack occurred in the mid-1990s (interest and intent predating even that), early adopters did not attain success until the 2000s. Most notably, Hezbollah was on the leading edge being the first group to launch a drone into enemy territory (2004), weaponize one (2006), and cause casualties with an armed drone (2014) (Hoenig 2014). It was this latter year that the phenomenon really began to spread to other groups and increase in frequency. This reflects two reinforcing drivers of drone adoption.

First, new innovations generally ascend through four phases: (1) early adoption among few first movers, (2) iteration with slow progress and mixed results, (3) breakthrough in both technologies and user success, and (4) competition as it cascades into society (Gartenstein-Ross, Clarke and Shear 2020). VNSA drone adoption hugs this curve. Early adopters – Hezbollah, al-Qaeda, Haqqani network, Hamas, Lashkar-e-Taiba, the Taliban, Fuerzas Armadas Revolucionarias de Colombia, etc. – tampered and refined at a trickling rate. Notably, these groups were either renowned for innovation, state-sponsored, and/or closely networked with other early adopters (Chávez and Swed 2022a). As the commercial drone industry stabilized, expanded, and advanced, so did VNSA drone use (Chávez and Swed 2020). With scarce resources, the costs of failure when investing in innovation are high. Thus, many groups get on board with a new technology only when it becomes reliable enough to democratize into the global market (Hammes 2019). Second, a key means by which innovations diffuse to illicit groups is through their networks. Militant groups learn how to assimilate drones into their arsenals from partners and by emulating competitors, even adversaries. This implies that the spread of drone use among VNSAs will not only keep pace with the commercial market but will expand as it travels to and diffuses across new social network nodes (Chávez and Swed 2022b).

5 How?

The most common application is for ISR. For VNSAs seeking to deflect brute force from a stronger opponent, understanding the distribution and movement of their forces is imperative. The unobtrusive aerial vantage point delivers this information to militant leaders. The Taliban and other Afghani rebel groups near-constantly monitored American troop activity to evade, coordinate, and attack (Trevithick 2018). Libyan and Maute rebels did the same with small commercial models in the 2011 civil war and a 2017 Filipino insurgency, respectively (Ackerman 2011; Luna 2017). Contraband smugglers from Australia to the Americas watch docks, borders, and delivery sites to circumvent or distract security forces (Tucker 2018). A United States Homeland Security official reported over 9,000 drone incursions across the southern border in 2021 to observe law enforcement activity in support of human and drug trafficking operations. Only about 12 were captured (Judicial Watch 2022). Of course, many groups observe militaries in active conflict theaters to gain any intelligence edge and for target acquisition for other weapon systems. In the Russo-Ukrainian War, soldiers and civilians alike observe and relay information to defensive units, such as the teenager who piloted “the drone that saved Kyiv” (Simko-Bednarski 2022).

Another way that VNSAs leverage commercial UAVs is in generating propaganda for recruitment and to taunt or intimidate enemies. Islamic State in Iraq and the Levant (ISIL) is notorious for this, publishing aerial imagery of their territory, training drills, battle successes, and beheadings across social media (Stalinsky and Sosnow 2017). The Jalisco New Generation Cartel is becoming so, such as when it filmed and posted its own drone bombing of a civilian camp in Michoacán to intimidate rivals and locals (Mexico News Daily 2022). Several other groups use drones for propaganda too – Hezbollah, Hamas, the Taliban, al-Qaeda, the Turkistan Islamic Party, Jabhat Fatah al-Sham, and other Syrian rebels, etc. (Chávez and Swed 2021). The United Wa State Army has even published drone cinematography of their drone fleet at a military parade advertising sophisticated weaponry for use and for sale (Zaw 2020).

In more aggressive applications, VNSAs use drones to disrupt security, economic, and political processes. In one example, an American criminal group divebombed agents with the Federal Bureau of Investigation (FBI) attempting a raid to rescue a hostage in 2018. Not only did the gang flush out the operatives from their hiding places, but they also broadcasted a live feed of the FBI’s mission failure on YouTube (Tucker 2018). The 2019 Houthi-claimed attack on critical energy infrastructure at the Saudi Aramco facilities in Khurais and Abqaiq are well known for curbing global oil supply by 5% for several days (Associated Press 2019). This same group, augmenting Iranian military drones with commercial technology to produce hybrid platforms (Conflict Armament Research 2020; Rogers 2021), derailed United Nations peace efforts in the region by targeting participating military officers on Yemeni and Saudi sides with an armed UAV (Segall 2019). Recognizing the potential for catastrophic harm or mass casualties in metropolises, many practitioners and security providers have piv-

oted attention to the threat of hostile UAVs to sensitive infrastructure and population-centric venues in Europe and North America.

Finally, several groups frequently and skillfully weaponize drones. Keeping focus on the Houthis, rebels killed six Yemeni officials at a military parade with a middle-grade Iranian combat drone including a governor, the chief of military intelligence, and both the chief and deputy chief of staff (Al-haj 2019). Syrian rebels have penetrated Russian air defenses and claimed casualties and property damage countless times, dropped bomblets on American troops guarding oil facilities, waged drone warfare against the government, enemy groups, and even ISIL as it encroached on their territory (Trevithick 2020). ISIL was just as aggressive with UAVs, performing tens to hundreds of attacks per month in the spring of 2017, even in swarms that repelled American forces, causing significant injuries on a daily basis (Gibbons-Neff 2017). Less sophisticated but no less damaging, long before tensions percolated to war Ukrainian separatists used a simple drone to drop a single thermite grenade on an ammunition depot, igniting 70,000 tons of munitions valued at approximately US $1B (Mizokami 2017). Less sophisticated still on the weaponization front, Latin American drug cartels are rigging their drones with homemade bombs as turf warfare escalates (Hambling 2021).

6 So What?

The increasing pace, spread, and variety of VNSAs harnessing drones should preoccupy security providers and policymakers. This means that already scarce attention and resources must be diverted to the degree that malign drones threaten governance and security in a given place. We counsel action on three fronts. The most strategic solution is to mitigate the development of drone programs. We acknowledge the difficulty of regulating dual-use, private sector products. This is especially the case in a layered, global market, where manufacturers can relocate or funnel sales upon regulation (Schulzke 2019). Nonetheless, proactive, structural solutions are more robust than reacting to the many, multidimensional effects of fully matured drone programs. Such efforts might be regulatory, financial, or coercive depending on the threat and the nature of available intelligence on VNSA groups and their networks.

Second, insofar as malign drones are a technological threat, there are and must continually be technological means of defense. The counter-drone industry is growing in size and sophistication. To maintain an edge on VNSA drone use, manufacturers must remain abreast of how and where militants are fielding drones, how and where security providers need solutions. There is no silver bullet counter-UAV platform, each solution addressing a finite range of threats. Layered defense concepts work well for stationary assets, deploying sensors and radars in the outermost envelope to detect, identify, and track drones; jamming techniques in the soft kill ring; and kinetic

options such as net or medium caliber guns and directed energy weapons in the hard kill zone. Mobile counter-drone tools range from shoulder-mounted units to fully integrated vehicle-borne kits. Just as there are diverse models of commercial drones used for diverse violent ends, so should there be diverse defensive systems tailored for security environments and anticipated threats. To that end, we recommend collaboration across states, law enforcement agencies, and civil-military divides to share ideas, lessons, and costs. We also encourage test exercises and regular calibrations of counter-UAV suites in the terrain, infrastructure, digital landscapes, and anticipated activity within their operational envelopes as threats change.

Third, insofar as malign drones are a doctrinal innovation among VNSAs, technological responses deployed independent of sound doctrinal training will fall short. Security providers from the state to local levels, from military to private sectors must invest in training on counter-drone platforms and workable standard operating procedures. Effective responses will be those that are assimilated, well-practiced, and (where relevant) coordinated. At the same time, effective responses will continue to carefully track evolving VNSA drone use and adaptably keep pace. To that end, we promote interfacing with empirically informed scholarship, whether sourced from deep case knowledge, systematic patterns from quantitative data, or wargaming.

VNSA drone use will evolve. Security providers should expect more diffusion, more innovation, and an increasing complexity of conflict and security challenges. As the commercial drone industry grows and as more malign groups observe successful UAV adoption by allies and enemies, terrorist and criminal airpower will become broader and denser. As the commercial drone industry advances in sophistication and more VNSAs experiment with cunning applications, the latter's drone use will become deeper. In addition, as militaries and security providers contend with a greater number, range, and diversity of actors in the airspace, maintaining tactical superiority will become a more complex endeavor (Chávez and Swed 2020). Parallel to these trends in the aerial domain, terrorists will continue to innovate with ground and aquatic drones too, presenting multi-spectrum challenges in security and conflict (LSS-SAPU 2018). For instance, some have rigged ground platforms with remote control sniper rifles and machine guns (Bunker and Keshavarz 2016). Moreover, there is a long record of drug cartels smuggling with unmanned submarines and a more recent one of suicide submarine drones (Ari-Gross 2021; Jones 2022).

In some cases, groups benefiting from state sponsorship will increasingly sport military-grade drones, including advanced and combat models. One need only observe the recent civil war in Libya to see the dangers in this. Both sides were sponsored by multiple states, both had powerful combat drones, and both used them liberally. By 2019, the Libyan National Army had killed a devastating number of civilians with drone strikes. In fact, it is estimated that over 60% of all civilian casualties perpetrated since Khalifa Haftar took command resulted from drones deployed with little care for discrimination (Raghavan 2019). Since VNSAs are less constrained by norms and laws than states, instances of access to heavier and higher-performance

drones should be of grave concern (Chávez and Swed 2021). Despite being an interstate conflict, the Russo-Ukrainian War features several nonstate and nontraditional combatants – resistance fighters, militias, foreign fighters, and private contractors – with access to commercial and military drones who might similarly disregard humanitarian norms as it endures. For instance, Russia is recruiting UAV operators to pilot shipments of Iranian drones through the Wagner Group, a mercenary company accused of war crimes and commuting life prison sentences to fill its ranks on the Ukrainian warfront (Walsh 2021; Murphy 2022; Treadstone 71 2022). Overall, the drone age has dawned, and it comes with new vulnerabilities. VNSAs leveraging drones is and will progressively be a primary one.

Seminar Questions

1. What makes commercial drones feasible and effective for violent nonstate actors?
2. What are the two reinforcing drivers of VNSA drone adoption that explain its pace of expansion?
3. How are armed nonstate groups using drones? Which do you find most surprising? Most concerning?
4. How should security providers defend against militant commercial drones?

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23 Game-Changing Drones? The Record from Libya to Ukraine

Abstract: Unmanned aerial vehicles, or drones, have become integral tools in contemporary political violence and employed in diverse scenarios by a variety of state and non-state actors. They encompass a spectrum of capabilities, from off-the-shelf drones used for intelligence and reconnaissance to technologically advanced armed UAVs used by major military powers. To understand this evolving drone landscape, including an expansion of emerging manufacturers like Turkey and Iran, we highlight case studies of recent conflicts: civil wars (Libya 2019–2020), conflicts with external intervention (Yemen 2015–2022), revolts (Ethiopia 2020–2022), and interstate conflicts (Russia-Ukraine 2022–present). In doing so, the chapter emphasizes the role of external support in drone provision and employment while critically assessing drones' actual impact in modern conflict. It tests the notion of drones as definitive game-changers and acknowledges the challenges of gathering accurate information in complex conflicts, especially in cases with limited data availability like Ethiopia.

Keywords: Unmanned aerial vehicles (UAVs), modern conflict, external states, proxy conflict, civil wars

1 Introduction

Unmanned aerial vehicles (UAVs) – or drones, to use their more commonly used moniker – have emerged as a ubiquitous feature of modern political violence. They are now used in diverse settings by a range of actors, from states wrestling with one another over territory to non-state actors seeking a way to harm stronger appointments. The diversity of devices in modern conflict and the multitudinous uses to which they are put is bewildering. Forces as different as rag-tag militias and great power militaries have incorporated small commercial, off-the-shelf (COTS) drones for intelligence, surveillance, and reconnaissance (ISR) as well as to drop bomblets on their often-unsuspecting foes. Sophisticated armed drones, once the preserve of only a handful of powerful states, have proliferated across the globe and are a major feature of contemporary conflict. More recently, explosive-laden, one-way attack drones have provided users with a relatively cheap form of long-range precision strike capability. In essence, a rudimentary form of cruise missile is now available to any actor able to produce explosive-laden drones or with a willing patron to supply them.

Not all actors can access military-grade drones and, what is more, not all states can build such devices. But the relative ease of using an increasingly available tech-

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nology – even if rudimentary or “jerry rigged” – breaks down many barriers inhibiting drone usage by non-state armed actors. At any rate, the drone market has also reached a level of maturity whereby there are plenty of options for prospective buyers from a long list of armed drone-producing states, that includes not just great powers, but capable combat drone manufacturers like Turkey and Iran.

How can observers make sense of this fast-evolving drone landscape? What patterns, if any, can be discerned. One place to start is to draw on the recent empirical record, that is, cases of drone usage in real-world conflicts. Political violence continues to remain a perennial fixture in international affairs and case studies are thus readily available. As each conflict is *sui generis*, what applies in one case may not hold in others. But differences across conflict settings and the actors involved are useful for purposes of cross-case comparison of drone usage. Indeed, we seek to isolate what is common across cases and what is different and suggest why that may be. To this end, this empirically driven chapter has selected cases based on a rough categorization of conflict type. We examine drone usage in a civil war (Libya 2019–2020 – an intense period of fighting within a wider civil war), in a war pitting a foreign-backed quasi-government against external interveners supporting the previous government in retreat (Yemen 2015–2022), drones in a revolt against government forces (Ethiopia 2020–2022), and, finally, in an interstate conflict (Russia-Ukraine 2022 to present).

While the four case studies provide the empirical data to inductively draw out some patterns about the evolving use of armed drones in modern conflict, there are certain themes that we believe deserve special attention. One of these is the importance of external support, not just in the provision of drone systems but also in their employment. Another area of focus is in gauging the actual effects of drones in the conflicts under study relative to other means. It has become axiomatic in some quarters that drones are a game-changer for modern conflict. This chapter is in part an effort to put some analytical pressure on this often unchallenged claim.

Despite the proliferation of armed drone usage and the great attention paid to their role by academics and pundits alike, there are limitations in making observations about these systems in modern conflict. Even in today’s data rich world, up-to-date and accurate information is often hard to come by and events in current conflicts are often open to multiple interpretations. Where possible, we draw upon multiple sources of information in a process of triangulation to bring us somewhere approximate to presenting accurate accounts. However, even here, a multiplicity of sources about armed drone usage and their reported effects may lead to more confusion, not less. In some cases, like Ethiopia, reports are so few and information so hard to come by that information is difficult to verify.

After presenting the empirical case studies, the chapter will close with a short summary elucidating the main inductively drawn cross-case conclusions.

2 Libyan Civil War, 2019–2020

Following Libyan leader Muammar Gaddafi's downfall after 42 years in power, the country rapidly descended into violence among competing militias and political movements (Chivvis 2013). By 2015, two main factions had emerged. The first was the UN- and, subsequently, Turkey-backed Government of National Accord (GNA) based in the capital, Tripoli, which controlled of much of the western coastal areas. The second faction was the United Arab Emirates (UAE), Russia, and Egypt-backed Libyan National Army (LNA) in the east, led by Khalifa Haftar and centered in Tobruk.

While the civil war began shortly after Gaddafi's death in 2011, the east-west split spilled into open warfare in 2019 when the LNA launched a campaign to wrest the western coastal areas from GNA control, including Tripoli. It was during this time that Turkey, a Mediterranean country with strong national security interests in Libya, became heavily involved in backing the GNA, to include Ankara's provision of Turkish armed drones. Focusing on this distinct period is useful for the purposes of this chapter as drones – from Turkey as well as other third-party states – were central in the fighting. Indeed, from April 2019 to November 2019 there were over a thousand reported drone strikes (Calcara et al. 2022, 150), leading the Head of the UN's Support Mission in Libya to label this military campaign "the largest drone war in the world" (UN 2019) and analysts to claim that drones were a "game-changer" in this conflict (Kington 2020).

A deeper examination of events should caution against claims that drone usage in Libya had revolutionary implications for warfare (Calcara et al. 2022). For one thing, armed drones suffered extraordinarily high attrition rates from ground-to-air missiles. By some estimates, the GNA lost 22 of its 24 Turkish-supplied Bayraktar TB2 armed drones between early 2019 and mid-2020 (Cole and Cole 2020), especially to the LNA's Russian-made short-range air defense systems (Pantsir S-1), gifted by the UAE. The LNA fleet of armed drones, in contrast, suffered much less due to the GNA's initially inferior air defense capabilities. Nevertheless, it still lost between a third to half of its Chinese-built Wing Loong armed drones (Gady 2019).

LNA drone attrition rates increased dramatically after Turkey deployed its HAWK II surface-to-air batteries to GNA-controlled airports and introduced its KORAL advanced electronic warfare systems to blind the LNA's air defenses. The latter allowed the GNA to restart drone attacks against GNA forces with resupplied Turkish TB2s (Calcara et al. 2022, 151; Taşdan 2021). In short order, Turkish drone operators were able to destroy LNA military vehicles, missiles systems, and drones (Rossiter and Cannon 2022, 217; Calcara et al. 2022, 151). The LNA responded to this reversal in May 2020, when they deactivated their radars and switched to electro-optical sensors, avoiding Turkish electronic warfare jamming and detection. Consequently, the LNA were again able to shoot down several TB2 armed drones. But it was too late for the LNA. Its offensive to destroy the GNA and take Tripoli had faltered at a critical moment; the battle for Tripoli was over with the GNA still in control and, indeed, on the offensive.

Armed drones should be understood as a force multiplier that helped tilt the military balance when used in conjunction with other military assets in the Western Libyan campaign (Fishman and Hiney 2020). Turkish drones and operators coupled with electronic warfare systems and HAWK II batteries gave the GNA air superiority for a time. This did have a demonstrable effect and allowed the GNA to enter peace negotiations as the military and political equal of the LNA, which had been backed by an array of powerful third-party states. Nevertheless, drone warfare did not decide the outcome of this intense period of the civil war. Instead, both sides relied on infantry to seize and hold territory and defend strategic infrastructures (Pack and Pusztai 2020). Drones were incapable of doing so but provided necessary air superiority and ISR capabilities that assisted both sides in a seesaw fashion that favored the LNA first and then the GNA.

3 Yemen, 2015 to 2022

From the outbreak of this war, drones have taken on an increasingly prominent role as a political weapon, especially for the Houthi. While the historical, social, and political causes of the Yemen conflict are highly complex (Brandt 2017; Pridham 2020), for the purposes of this chapter, we begin with the *casus belli* that led to external state intervention. This can be dated to late 2014 when, after several weeks of street protests against the internationally recognized government of Abdrabbuh Mansur Hadi, Houthi fighters fought the Yemen army and seized control of Sana'a, the capital (Lackner 2019). The Houthi, hailing mostly from Yemen's north, are a Zaydi Shiite movement that has fought the country's Sunni-majority government since the early 2000s. In February 2015, Hadi escaped house arrest in Sana'a for Aden where he declared the Houthi takeover illegitimate as they and their allies advanced on Aden. This brought Saudi Arabia, in mid-March, to militarily intervene alongside eight other Arab states, to include the UAE and Bahrain, against the Houthi.

As early as 2016, the UAE Presidential Guard reportedly intercepted UAVs in the area of Aden International Airport. Soon after, in 2017, the Houthi claimed to have manufactured their own system, the Qasef-1, although independent researchers strongly suspected the drone was in fact Iranian in origin, given the similarities with the Iranian Ababil-2 drone (CAR 2017). In January 2019, Houthi fighters used a bomb-laden drone to attack Yemeni military officials during a military parade at an air base near Aden that killed at least six people, including the head of military intelligence (Samaan 2020, 56; Al-Haj 2019). Drones have also been used to good effect by the Houthi in propaganda campaigns, with the media outlets linked to the group issuing numerous threats against targets in Saudi or Emirati territories and releasing video footage of past attacks (Samaan 2020, 58). In July 2018, for example, pro-Houthi media released video of what it said was

one of its drones dropping bomblets on Saudi and Emirati troops in the field (Shanahan 2022).

The tempo of armed drone and missile strikes by the Houthi on targets across the border into Saudi Arabia increased as a war of static positions unfolded (Samaan 2020, 55). In mid-2019, Houthi bomb-laden drones were striking oil pumping stations deep into Saudi territory and against airports in adjacent Najran and Jizan provinces. The Houthi began replacing their basic Qasef-1s (CAR 2017, 8) with the inexpensive Samad or Sammad family of drones that can fly much further distances (Binnie 2019; Kirkpatrick et al. 2019). With evident Iranian material and technical support, the Houthi began using their improved devices for long-range precision strike against their adversaries' infrastructure. Alongside more conventional extended-range ballistic missiles, the Houthi launched explosive-laden drones against targets deep into Saudi Arabia and the UAE in early 2022 (Turak 2022) in an attempted strategy of compellence against Saudi Arabia and the UAE. The Houthi claimed a Samad-3 attack on Abu Dhabi International Airport in 2018, which was denied by the UAE government. Evidence shows this was highly unlikely (Dewan 2018). However, there were confirmed drone attacks in January 2022 in Abu Dhabi that killed three and wounded six. The 851 attempted drone attacks against Saudi Arabia, as of late 2021, were concerning but did little damage and came to be viewed as little more than a nuisance (Reuters 2021). Rather, it was the Houthi missile attacks on Riyadh that made the headlines and rattled nerves.

The Saudi-led coalition became increasingly assertive and effective in their use of drones as the war progressed but mainly for lethal precision strikes. In 2018, the UAE reportedly assassinated Saleh al-Samad, the president of the Houthi' Supreme Political Council, with a Chinese-made Wing Loong II, a drone that has been compared to the American MQ-9 Reaper (Shaif and Watling 2018). For the Saudi-led coalition, however, conventional airstrikes have featured much more prominently than drones for attacking the Houthi and their allies. Indeed, for a country operating one of the largest and most modern air force in the Arab world, Saudi Arabia possesses remarkably few armed drones. Some of this has to do with armed drones themselves. Drones have had some limited efficacy in the Yemen war. While their ISR utility should not be downplayed, allowing the Saudi-led coalition to call in air strikes by conventional jet fighters or artillery and the Houthi to locate their adversaries, the utility of armed drones as attack vectors are much less pronounced. Against non-state armed actors, however, they may have less efficacy if, like the Houthi, they have access to man-portable air-defense systems (MANPADS) or other portable missile systems that can threaten and destroy low-flying aircraft, to include drones.

Armed drones have also done little to shift positions on the ground in Yemen nor have they compelled Riyadh to question its involvement in the conflict or change its course. Drones, like all air power, cannot hold ground and thus infantry and artillery, as in ages past, have played the preponderant role in combat outcomes in Yemen, as the Battle for Yemen and other UAE military operations against the Houthi clearly

demonstrated (Yates 2020, 295–302). Perhaps the biggest impact of drones on the conflict have been their long-range attacks on the UAE, a country sharing no common borders with Yemen. Despite the finite damage done to infrastructure and the small number of civilians killed, the chilling fact that the Houthi could strike such distant targets did provide them with dramatic propaganda and made leaders in Abu Dhabi reflect on the cost versus benefits of continued direct military involvement.

4 Ethiopia, 2020 to 2022

When the dominant political party in Ethiopia's Tigray state, the TPLF, rejected the capital's choice of governor and held their own elections, the federal government led by Prime Minister Abiy Ahmed saw this as a rebellion. Abiy ordered the Ethiopian National Defense Force (ENDF) to mobilize and invade Tigray in early November 2020. This civil war, pitting the Ethiopian federal government against the political and armed forces of Tigray, a state in the country's north, had complex antecedents (Searcy 2021) and, like Yemen, consequences that reached far beyond its own region, the Horn of Africa.

One of the reasons the case of drone warfare in Ethiopia is of interest is because it was such a lopsided affair. The ENDF maintained air supremacy throughout the entire campaign despite their aging and meager air force as well as the late entry of armed drones supplied by external state backers of the regime in the capital, Addis Ababa. Indeed, air strikes, in the main, appear to have come from Ethiopia's aging, Russian-made, heavy payload-carrying SU-25s or MiG-23s fixed wing attack aircraft, given their destruction and the number killed (Tastekin 2022). But Addis Ababa was unable to count on the support of a European partner, such as France with which it had signed a series of defense agreements just prior to the war's outbreak because of their arms embargo on both belligerents (Cannon 2022). Indeed, despite providing no military support to the Tigray Defence Force (TDF), US and European condemnation of the war and arms embargoes were viewed by the Abiy government as de facto support for the Tigrayan separatists. Accordingly, Addis Ababa turned to China and Turkey for political support and arms, particularly air power (Cannon 2022). Chinese Wing Loong I drones along with Chinese-made TL-1 air-to-surface missiles were reportedly based at Harar Meda airbase and being used by Ethiopian forces in 2021 (Mitzer and Oliemans 2021a; Mitzer and Oliemans 2021b). Ethiopia had ten Wing Loong I drones in early 2022. These were supplemented by at least four Bayraktar TB2 drones from Turkey, part of a defense agreement signed between the two states in August 2021. Manufactured by Baykar Makina and its CTO Selçuk Bayraktar, the son-in-law of Turkey's President Recep Tayyip Erdoğan, the TB2's performance in warzones led to a record year of sales (Rossiter and Cannon 2022, 221–223). This led to Erdoğan to enthuse: "Wherever we went in Africa, they asked us [Turkey] for drones, armed drones" (Mutlu and Demirbaş 2021). Turkey

duly complied, hampered only by its inability to produce enough drones to satisfy the surging demand.

Despite bombastic headlines about drones being game changers in the war (Dunne 2022; Mwareya and Simango 2022), their usage has been limited and difficult to verify because reports generally refer to strikes by the Ethiopian air force and do not differentiate between attack aircraft and drones (Farge 2022). Even when Turkish TB2s were verifiably used against Tigrayan forces, for instance, they played a supporting role vis-à-vis ISR not only because they lacked munitions but also because Ethiopian attack aircraft provided a bigger punch with dumb bombs and other heavy payloads (Mitzer and Oliemans 2021a). Nevertheless, TB2 drones have been infamously credited with civilian deaths (Marks 2022). This has led to a blowback for both Ethiopia's government and Turkey. "Such unwanted publicity may result in a negative reputation for the TB2 like that of the US-made Predator drone, which is both renowned and maligned for its firepower. In turn, Turkey's new-found and growing international prestige – a portion of which rests on the merits of drones like the TB2 – may suffer" (Rossiter and Cannon 2022, 222–223).

For Ethiopia, the drones grabbed the headlines but the record shows that their bark proved louder than their bite. Part of the explanation for armed drone underperformance may have to do with inexperienced drone operators. While Chinese-made Wing Loong I's were partially credited with helping stem Tigrayan advances on the capital and in other locations, Iranian-made Mohajer-6 drones underperformed on account of problems in their control systems, low flight ceiling and vulnerability to ground fire (Mitzer and Oliemans 2021c). This prompted anger and disbelief from Addis Ababa on account of their relatively high price tag for the Ethiopian government.

TB2 and Wing Loong drones, which both performed capably, at times, in Libya, are suitably lethal when attacking supply lines and isolated targets such as small buildings or artillery pieces. But when the Tigray offensive approached within 60 km of the capital and frontlines were lengthy and relatively static for a time, armed drones provided less bang for their buck than jet aircraft and their much heavier payloads of munitions. Finally, like Yemen, territory is not taken or held by air power, rather it plays a secondary, albeit at times critical role. The peace deal signed between the Ethiopian government and the Tigrayan political leadership in October 2022 may prove ephemeral, despite conflict setbacks suffered by both sides. It seems plausible, nonetheless, to conclude that armed drones played a supporting role in bringing the belligerents to the table.

5 Ukraine, 2022 to Present

Perhaps better than any other conflict, the Ukraine War that began in February 2022 demonstrates both the hype and the realities of armed drone usage in modern war-

fare. The conflict pitted two well-armed states, Russia against Ukraine, replete with all the trappings of next generation warfare: drones, cyber, and information warfare capabilities. On top of these, overwhelming Russian military might – it regularly ranks as the second most powerful military in the world – led many to believe that new and old types of warfare would lead to Kyiv's capitulation within weeks. The Ukrainians, however, put up a stiff resistance and foiled the Kremlin's attempts to topple the government (DeVore, Orr, and Rossiter 2022). Indeed, by late 2022, Ukrainian forces, funded and armed by all the major Western powers, had retaken large slices of territory in the country's east and south that had previously been occupied by Russia.

Right from the start, Turkish-built Bayraktar TB2 armed drones were used against the invading Russian forces, on land and at sea. Indeed, the TB2 and its reportedly lethal force against a more powerful adversary became one of the most prominent features of the early stages of the war and gave heart to the beleaguered Ukrainian resistance. Ukrainian social media posts were replete with images of TB2s striking targets. Videos from its sensors were uploaded to various social media platforms. So beloved did the TB2s become among the Ukrainians that songs were written about them, and shops named after them.

To be sure, the TB2s proved their operational worth, especially in the first weeks of the conflict when Russian lightly armored and under-supported forces thrusted into Ukraine with highly exposed supply lines and minimal tactical air defense. Ukrainian TB2 operators were also savvy. They would fly, as Stein (2022) notes, "at less than one thousand feet, in order to get lost in the ground clutter and hide from patrolling fighters." They would also use terrain to hide from longer-range acquisitions radar and then pop up and strike. Part of this can be explained by the fact that Ukraine was an early believer in and adopter of Turkey's TB2. It signed a contract in 2019 worth $69 million for six TB2 systems and munitions. In September 2021, five months before hostilities began with Russia, Ukraine doubled down and sought to buy 24 more. Having used them successfully against targets in eastern Ukraine's Donbas region occupied by Russia since 2014, Ukraine's drone operators had clearly learned to operate them optimally prior to the war (Rossiter and Cannon 2022, 219).

As spring turned to summer, the hype about the TB2 began falling nearly as fast as the armed drones did to advanced Russian air defense and electronic warfare systems. As early as June, Ukrainian fighter pilots were describing the Bayraktars as "almost useless" after Russia had built up good air defenses (Detsch 2022). Their poor survivability, nevertheless, did not knock them completely out of the war. The TB2 is so inexpensive to build that Kyiv can suffer high rates of attrition and keep on fighting with TB2 systems imported from Turkey. Furthermore, despite the reported three-year backlog on account of demand for the TB2, Ukrainians have been able to repair and reconstruct their drones because they are made with commercial, off-the-shelf parts (Stein 2022).

TB2s are not the only drones flying in the skies above Ukraine and both Russian and Ukrainian drones used for ISR gives the belligerents 24-hour coverage of the bat-

tlefields. Russia's catapulted, airplane-shaped Orlan-10 drones, have also been mostly used to correct artillery barrages, surveil for enemy movement, or jam local cellphone towers. The Ukrainians have deployed reconnaissance UAVs to mark the coordinates of Russian command posts, artillery batteries, electronic warfare systems, and ammunition depots. They act as spotters for Western-provided multiple-launch rocket systems, redirecting the rocket fire in real time or carrying out battlefield damage assessment. Ukrainian forces have also put to good use adapted local small drones such as the Aerorozvidka R18 octocopter, which was specifically designed to drop bomblet drops. It can operate in the dark, using thermal-imaging cameras to spot enemy troops and vehicles. Stripped of everything but essential components, the drone carries cheap, armor-piercing grenades fitted with 3D-printed tail fins that have reportedly achieved tank kills (Chapple 2022).

One of the most curious things about the Ukraine War is the almost complete absence of Russian airpower, particularly its advanced attack aircraft. Correspondingly, armed drones have played a minor role in Russia's war against Ukraine. The Russian Orion, similar, in silhouette at least, to the American-made MQ-9 Reaper, recorded several strikes on Ukrainian vehicles in the weeks after the February invasion. However, Russian forces were likely hesitant to deploy these expensive and hard-to-replace systems after one was shot down by Ukrainian forces in April (Axe 2022).

"Kamikaze" drones came to prominence in the war after Russian setbacks on the battlefield in the fall of 2022. These one-way attack drones – alongside more conventional missiles – have increasingly been used by Moscow to target Ukraine's civilian infrastructure, damaging the country's electricity and water supply. Most of these one-way attack drones are not Russian, however; they are Iranian-supplied HESA Shahed-136 armed drones, or Geran-2 in the Russian service. Russia surprised Ukraine and its Western backers in its initial saturation attacks, which minimized effective retaliation by Ukrainian air defenses. These saturation attacks involve several drones (batches of five or more) launched at once from the same rack or launcher to overwhelm enemy air defenses. Up to 12 one-way attack drones have been used in a single swarm attack (Kadam 2022).

Russia has reportedly modified the Iranian-made drones' inertial guidance system replaced by the control unit GLONASS, Russia's satellite navigation system (Dangwal 2022). Despite reports that Russia will produce its own Shahed-136 drones, it is the limits of Russia's domestic production that have led Moscow to rely on Iran. As seen with Turkish drones in Libya, there are claims by Western governments that Iranian drone operators are on the ground in Russian-occupied Crimea to provide technical and targeting support. Ukrainians have certainly felt the ill effects of Iranian drones as they destroyed power-producing and water facilities. As successful as they have been, however, Ukrainian air defenses had reportedly shot down over 300 Shahed-136s as of October 2022 (Reuters 2022).

It was the Ukrainians who first used one-way attack drones when they adeptly used the US-made and tube-launched Switchblade loitering munition. Using a live video feed to zero in on targets up to 10 kilometers away and fitted with a grenade-

sized warhead capable of damaging unarmored vehicles, Switchblades have proven an effective force multiplier at the small combat unit level. Ukraine also launched larger, long-range one-way attack drones far into Russian territory in late 2022.

Notwithstanding its very real operational benefit to Ukrainian resistance of the TB2s or the destructive power of the Shahed-136 by Russia, the stature of armed drones (as opposed to their highly important role as ISR tools) in the Ukraine War is out of proportion to their battlefield contributions. Artillery and infantry remain the most important elements in the Ukraine War. Territory has been won or lost in much the same way it was when Russian and German armies clashed in what was then the Ukrainian SSR during World War II. Air supremacy, then and now, is critical to the success of armies, but the preponderance of force in skies over Ukraine seems closer to stalemate than either side gaining supremacy. Drones of various types – armed and unarmed – have been used in support of ground forces rather than as battlefield-winning weapons. Russia's late 2022 concentration on the use of one-way attack drones to target Ukrainian infrastructure should not be viewed as a novel tactic using a novel weapon, but one borne out of desperation over the loss of significant territory to attacking Ukrainian forces. In essence, by turning to a weaker state, Iran, for its loitering and swarming drones showed just how bare the Russian military cupboard had become and the paucity of its own military solutions. Bombing civilian infrastructure certainly hurts, but countless wars in which massive airpower was employed, from World War II to Vietnam, show that capitulation can only be achieved with an enemy's defeat on land, sea, and air and the capture of the capital. Predicting the future is fraught, but it seems at this point that Russian attempts to compel Ukraine to capitulate or negotiate on account of kamikaze drone strikes are destined to fail.

6 Cross-Case Conclusions

Drones have not proved to be a game-changer in the conflicts examined, nor can they be said to represent some revolution of military affairs. At the tactical level, however, the lower cost, proliferation, and availability of armed drones for longer-ranged and more-sophisticated operations can be decisive when used in combination with electronic warfare capabilities. Well-built *and* affordable drones can sustain attrition and keep the possessor in the fight, as clearly seen in the Ukraine War and the Libyan civil war. If they give a belligerent air superiority, as in the case of Ethiopia, they can be a force multiplier and provide tactical advantages that could fundamentally shift battlefield dynamics. Nevertheless, as the Tigray War shows, the federal government's small number of drone systems, lack of payload munitions, and sub-par operators combined to stymie the promise of combat drones.

Proxy warfare, whereby third-party states intervened indirectly in a pre-existing conflict to attempt to influence conflict outcomes, was the norm in all conflicts, but

less pronounced in Ethiopia and more so in Ukraine. This dynamic has especial import because third parties supplied armed drones to their belligerent of choice in each conflict. Indeed, all parties in these conflicts have relied – to varying degrees of course – on external provision of drone systems.

Some broad lessons are, therefore, found in our four conflict cases. Firstly, cheap tactical drones are becoming necessary for close-support operations in today's conflicts regardless of environment and belligerents' capabilities. Secondly, the quality of supporting architecture, such as the availability of skilled drone operators, are absolutely essential for successful drone strikes against evenly matched adversaries. In Libya, Turkish drones were ineffective against the LNA's air superiority until Turkey supplied electronic warfare systems, drone operators from Baykar, and air defenses. Third, armed drone usage, whether in the hands of non-state armed actors or states, is also highly contingent on the conflict's setting (Rossiter 2018). In past conflicts, drones were typically used by one side over largely uncontested airspace to locate and hit targets – for example, in US operations in Afghanistan, the Middle East, and Somalia (Cannon 2020). In the conflicts surveyed here, except that of Ethiopia, drone operating states and forces have had to contend with air defenses, which has at least partially limited armed drones' effectiveness on account of the detection, communication, destruction, and precision capabilities available to defenders against drones. This is part of what Calcara et al. (2022) term the second firepower revolution that, in part, leads to the enduring hider-finder competition we see in current drone warfare. Finally, infantry and artillery deployment, tactical usage, and resupply continue to play *the* major roles in conflict outcomes. This is, in part, because close combat dynamics continue to characterize warfare as they have since time immemorial. Russian officers may have a better idea of where their Ukrainian foes are on account of better ISR from drones. This gives them an incredible advantage over their historical counterparts and should not be understated. Their ability to exploit this advantage, however, remains contingent on their capabilities at hand and, just as critically, what their adversary has on hand to defend itself with and then counterattack.

Seminar Questions

1. Why is it appropriate to examine different varieties of UAVs when considering the role drones play in modern conflict?
2. Based on the empirical record, do drones warrant the title of "game-changing" weapons?
3. How important is external support for weak actors to be able to utilize drone warfare?

4. Are there conflict settings in which drone usage is especially efficacious, and vice versa?
5. To what extent is the Ukraine-Russia war a drone war?

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Part 4: **A Third Drone Age?** **Concerns and Visions for the Future**

Concerns

Anna Jackman

24 Domestic Drones and Domestic Threat: Urban Life in the Drone Age

Abstract: Drones have emerged as an established feature of contemporary global battlefields. Comprising a growing ecosystem of diverse platforms, attention is increasingly paid to the rising interest in and deployment of small, commercially available off-the-shelf (COTS) drones. In recognition of growing non-state actor usage of COTS drones in surveillance and weaponized capacities both in and beyond the battlefield, concern continues to grow around the potential portability and expansion of drone-enabled harm. This chapter examines drone threats in domestic urban locales in the age of the small drone. It proceeds in three parts. First, it outlines a four-part typology of current urban drone threats. Second, it reflects on spaces of innovation and imagination which may inform the extension of such drone threats. Third, it emplaces the drone within the context of evolving airspace to consider five areas of potential future urban drone threat.

Keywords: Drones, UAV, urban, domestic threat

1 Introduction

Drones are at once an established feature of global battlefields and contemporary conflict, and comprise an increasingly diverse ecosystem of platforms (Chávez and Swed 2020). Alongside the estimated 102 countries with an 'active military drone inventory' (UN General Assembly 2020, 4), non-state actors are increasingly embracing drones as battlefield commodities and tools. In recognition that commercially-available off-the-shelf (COTS) drones are readily accessible and 'increasingly prevalent features of the global battlefield' (Jackman 2019a, 362), this chapter reflects on (evolving) drone threats in domestic urban locales in the age of the small drone.

While recognizing the growing range of beneficial applications with which drones are associated, this chapter approaches the drone as a complex, malleable, and ambiguous technology. As drone use remains increasingly 'widespread, diverse, sophisticated, and advancing' (Chávez and Swed 2020, 30), it explores the impacts of the 'introduction' and incorporation of drones upon the 'concept' and practice of 'air power' (Dominicus 2021, KN 2-1; Kleisbauer 2020). While recognizing that non-state actor drone usage remains 'contingent' (Rossiter 2018), it argues that drones continue to extend and expand aerial capabilities and capacities in notable ways. Building upon work that has drawn attention to the potential portability of drone threats into non-battlefield domestic urban spaces (Martins, Holland Michel, and Silkoset 2020), it

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Figure 24.1: Drone. Credit: Susanne Nilsson.
Source: https://www.flickr.com/photos/infomastern/28589018182/ (no permission required, CC BY-SA 2.0).

argues that the drone's 'inverse potential for exploitation' necessitates further attention (Jackman 2019a, 362). The chapter proceeds by first outlining a typology of current urban drone threats. Second, it shifts to consider some emerging spaces of innovation and imagination which may act to inform an extension and expansion of such drone threats. Lastly, it reflects on some potential future urban drone threats, emplacing drones within the wider and 'evolving backdrop' of urban warfare and conflict (Gisel et al. 2021), while closing with some questions prompted by this assessment as a whole.

2 Typology of Current Urban Drone Threats

As small COTS drones, as pictured in Figure 24.1, have become increasingly popular, available and accessible (Friese, Jenzen-Jones, and Smallwood 2016) their adoption has 'hit an inflection point' (Cronin 2021, 257). Alongside the growth of a range of socially and economically beneficial applications (Choi-Fitzpatrick 2020), drone misuse has increased in parallel. Deployed by non-state actors including terrorist groups, 'criminals and lone actors' alike (Homeland Security 2017, 1) to enable disruption, nuisance, crime, and malicious activity, drones are associated with an 'increasingly diverse range of risks' (Ministry of Defence and Department for Transport 2019, 1). In recognition that drone vulnerability has emerged as 'a general characteristic of most metropolitan areas' (Martins 2022b), this section offers a typology of existing urban

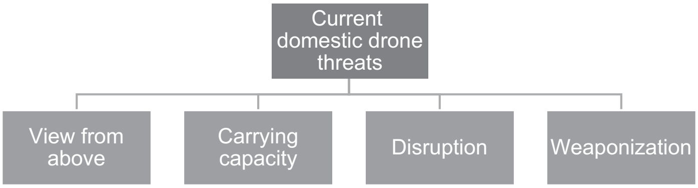

Figure 24.2: Typology of current domestic drone threats.

drone threats, focusing attention on four key areas: the view from above, carrying capacity, disruptive drones, and weaponization.

2.1 View from Above

Given that compact urban terrain both lessens the impact of limited flight range and congestion makes drones harder to detect, drones have been asserted as “well-suited to the urban environment” (Doctor and Walsh 2021, 75). As such, we are seeing the growing use of drones as tools to capture a view from above. The drone’s use as a tool to collect urban ‘data and intelligence’ from above (Danielsson 2022, 6) is evidenced clearly in the context of the 2022 Russian invasion of Ukraine. Providing ‘cheap eyes in the sky’ for ‘both sides’ (Kunertova 2022), drones have been understood as playing an ‘important and multidimensional role in this conflict’ (Martins 2022a). Further, the deployment of COTS drones as intelligence, surveillance and reconnaissance (ISR) platforms (Martins 2022a) has exceeded military actors and actions, with Ukrainian ‘drone enthusiasts’ responding to the military’s calls “to donate hobby drones and to volunteer as experienced pilots to operate them” (O’Brien 2022).

While the scale of the use of small COTS drones in Ukraine has been described as ‘unprecedented’ (Burgess 2022), drones have long been deployed to gather imagery and data in battlefield and conflict contexts (Abbott, Clarke, and Hickie 2016). Drones have been fielded in ‘operational’ capacities for the purpose of ISR, namely to surveil and monitor a scene to gather information to inform decisions and movements (Chávez and Swed 2020, 32; Rassler 2016, 2018). While operating in ‘unarmed’ capacities, the use of drones as ISR tools has nonetheless been recognized as ‘dangerous’ (Rogers and Kunertova 2022, 2). For example, non-state actors such as ISIS have ‘extensively used unarmed drones’ as ISR tools (Archambault and Veilleux-Lepage 2020, 956), using data gathered to inform ‘lethal’ activities on the ground (Rogers and Kunertova 2022, 2). Further, data-gathering drones have been deployed ‘strategically’ in the collection and communication of propaganda, used to publish and advertise (violent) imagery of ‘their operational successes’ (Chávez and Swed 2020, 32). As Archambault and Veilleux-Lepage (2020, 955, 961) note, drones have emerged as an ‘integral part of the

propaganda arsenal of certain non-state groups' and their usage can be understood in symbolic terms.

Beyond non-state actor deployment on the battlefield, drones have been used to capture data from the air in a growing range of ways, enacting and revealing a range of urban drone threats. Incidents have included the use of drones by criminals in scouting capacities to monitor police presence and movements (Tucker 2018; Sullivan, Cruz, and Bunker 2021), and to case sites – from farms to cash machines – to enable theft (Forgrave 2020; Mercer 2019b). Further, drones have been used by individuals and groups to capture sensitive imagery of different kinds. This has included flights over sensitive infrastructure – including corporate grounds, military and police installations, political sites, and critical infrastructure (Ministry of Defence and Department for Transport 2019; Solodov et al. 2018; Times of India 2021). Further, drone usage 'beyond authorized and accepted use' (Abbott, Clarke, and Hickie 2016, 10) has also included individuals using drones to surveil, spy on, and harass neighbors and ex-partners (BBC News 2020; Sulleyman 2017). Lastly, in understanding the drone as a tool as and to disrupt power, activists, protesters and journalists alike have deployed drones to 'watch the watchmen.' documenting the activity of police, militaries and corporations (Waghorn 2016, 99; see also Kaplan 2020; Schnepf 2019; Taylor 2022). While recognizing potential harms, we can therefore understand 'drone-afforded visibility' as differently deployed, motivated and impactful (Zuev and Bratchford 2020, 443).

2.2 Carrying Capacity: Contested Payloads

While notable as 'eyes in the sky,' drones are also carrying or transport devices that can be equipped with a growing diversity of payloads and material. Alongside carrying cameras and sensing apparatus, so too are drones being used to transport a growing range of goods and matter. While, as is examined below, non-state actors have utilized drones to carry and drop 'both improvised and repurposed munitions' (Sweetow 2022; Friese, Jenzen-Jones, and Smallwood 2016), we are also seeing citizens in conflict areas modifying the drone's carrying capacity in creative ways. For example, led by an PhD candidate, a team of people in Ukraine set up a "multi-functional UAV hub" designed to build, "repair and reconfigure consumer drones" in service of Ukrainian troops (Crumley 2022). Noting the rising price of lithium batteries, the group called on the community to donate "discarded e-cigarettes" with the aim of 'recharging the batteries' to use them as 'release systems mounted on the craft' (Crumley 2022). Such innovations supported the wider exploitation of the drone's carrying capacity in the conflict, wherein Ukrainians used drones to carry and drop a range of makeshift incendiary devices in targeting Russian troops and their supporting infrastructure (Kesslen 2022; Kunertova 2022).

The drone's carrying capacity has also been explored and exploited beyond spaces of conflict. Alongside the growing trialing and deployment of drones for the commercial and medical transport of goods and matter (Jackman and Jablonowski

2021; Martins, Lavallée, and Silkoset 2020), the drone's lifting capacity has been more widely reimagined, subject to citizen experimentation. For example, drones have been used as smuggling devices both to transport 'prohibited items' and contraband into prisons (Ministry of Defence and Department for Transport 2019, 2), and in the criminal carrying of goods and drugs in and across 'heavily guarded areas' such as border sites (Cronin 2021, 271; Bunker and Sullivan 2021).

Further, as we saw in the previous section, drones have emerged as 'an important new tool for civil society actors' (Choi-Fitzpatrick 2020, 208). Activists have turned to the drone's carrying capacity to communicate political solidarity (by flag flying), to protest nuclear power (by carrying small amounts of radioactive material), and to 'protest uneven abortion access and rights' (by carrying pills across borders) (Abbott, Clarke, and Hickie 2016, 13; sUAS News 2016). Further, citizens have also explored the drone's carrying capacity through 'do it yourself' (DIY) experimentation. From an individual's "pleasure of tinkering" (Jablonowski 2015, 2) to the (potentially) dangerous modification of drones, drones have certainly been the subject of 'improvised innovation' (Rassler 2016). For example, hobbyists and artists have playfully modified drones to carry novel payloads, retrofitting them with diverse items including fireworks, graffiti and silly string (Jackman 2019a). Such DIY modifications have also included 'experimental weaponizations,' with individuals outfitting drones with 'kinetic materials' from flamethrowers, paintballs, and rockets, to hand guns, BB guns, chainsaws, and tasers (Jackman 2019a, 370). While often modified in the interest of (playfully) testing the limits of the drone, it remains that the 'integration of small arms' is emerging (Friese, Jenzen-Jones, and Smallwood 2016, 28). Further, as such 'improvised capabilities' are highly visible in videos uploaded on social media (Rassler 2016), we should be cognizant of the potentially 'instructional' and inspirational role of such online spaces and communities (Chávez and Swed 2021; Friese, Jenzen-Jones, and Smallwood 2016; Jackman 2019a). This section reminds us that in an assessment of (potential) drone threat, the 'drone's malleability remains a key consideration' (Jackman 2019a, 370, 364).

2.3 Disruptive Drones or Drones for Disruption?

As interest in drones as tools for a growing range of urban applications increases, drones are commonly described as 'disruptive technologies,' a term referring to technology 'changing the way things are done' by industries, businesses and/or consumers (Cambridge Dictionary n.d.). Drones however also act to 'otherwise disrupt people, animals, and environments' (Jackman 2022b, 2). Thus, a third form of urban drone threat comes in the form of drones as tools of and for disruption.

Disruptive drone use includes that which both accidentally and purposefully disrupts policing and critical infrastructure activities and sites. For example, drones have been deployed by criminals to disrupt policing operations (Chávez and Swed 2021; Tucker 2018). Further, they have been flown in proximity to manned aircraft

and airports in a number of countries, disrupting airspace industries and activities (Martins, Holland Michel, and Silkoset 2020; Martins 2022a). Alongside a reported rise of ‘close calls’ between drones and manned aircraft prompting security concerns around the potential for a ‘bird strike type attack’ (Friese, Jenzen-Jones, and Smallwood 2016, 29), the drone’s disruptive capacity has been exemplified through high profile incidents at international airports. In December 2018 a drone (or drones) were reported to be witnessed at London’s Gatwick Airport, disrupting over 1,000 flights and 140,000 passengers over a 30-hour period (Shackle 2020), though it should be noted that such reports have subsequently been disputed. Further, while not coming to full fruition, the environmental activist group ‘Heathrow Pause’ made headlines following attempts to launch drones in the ‘airport’s 3.1 mile exclusion zone’ in order to exert “pressure on the government to take tougher steps to reduce carbon emissions” (Mercer 2019a). In addition to mounting concerns around the deployment of drones as tools to undertake a ‘deliberate act to disrupt an airport’ (Shackle 2020), drones have also been deployed as disruptive tools in wider protest contexts. For example, they have been flown in proximity to political leaders both to protest policy and urge political action (Gettinger 2013; Greenpeace 2021), as well as flown at large sporting events in protest of territorial disputes (BBC News 2014). The drone can thus again be understood as malleable in its potential for disruption.

2.4 Weaponization: Drones Deployed to Inflict Damage or Harm

Alongside their deployment as tools to capture a view from above, carry, and disrupt, drones have also been used in weaponized capacities. In the context of the battlefield, non-state actors have modified COTS drones by ‘cobbling together cheap components’ and ‘transforming’ them into devices to drop “small, and in some case lethal, explosive munitions from the air” (Rassler 2018, 2). While arguably ‘rudimentary’ (Martins, Holland Michel, and Silkoset 2020, 7), such weaponized drones have been deployed ‘at the tactical level’ to reach ‘otherwise unreachable targets’ and therefore ‘extend the range’ of non-state actor ‘lethality’ (Chávez and Swed 2020, 32). Here, drones laden with explosive materials have been deployed both as airborne improvised explosive devices (IEDs) to aerially target troops below (Rassler 2016, 2018; Friese, Jenzen-Jones, and Smallwood 2016), and in ‘trojan horse’ capacities, embedding explosives to later detonate when a captured drone is forensically investigated (Rogers 2017). Here, the use of drones in the 2022 Ukraine-Russia conflict is notable. Drones have been armed by Ukraine, for example, to ‘strike Russian targets’ (Martins 2022a). However, in thinking of the weaponization of drones, we should also consider the ‘psychological pressures’ and dimensions of drone attacks, as they ‘undermine the morale of the military and civilians alike’ more widely (Kunertova 2022). In other words, drone weaponization can be understood at once as potentially harmful to ‘personnel,’ infrastructure and ‘equipment’ as well as to the psychological damages of ‘buzzing back and forth’ over communities (Kramer 2022).

Mirroring the evolution of non-state actor drone use in the battlefield, weaponized drones have also been deployed in domestic and urban spaces in the infliction of damage and harm. Here, weaponized drones have been used in the (attempted) destruction of infrastructure, including oil refineries (Hubbard, Karasz, and Reed 2019), ammunition dump sites (Mizokami 2017), military sites (Reid 2018; Reuters 2022), and electrical grids (Mizokami 2021). In addition, drones have been used as tools intended to inflict harm. Here, drones have been outfitted with explosives and flown at political figures. Understood as drone-enabled 'assassination' (Rogers and Kunertova 2022, 4), weaponized drones have been used in attempted attacks on the Venezuelan President (Franke 2018) and Iraqi Prime Minister (Hambling 2021a), as well as reportedly forming part of the 2021 assassination of the Haitian President (Bunker and Sullivan 2021). Alongside targeting political figures, drones have also reportedly been weaponized by both criminal groups to attack gangs and security forces (Bunker and Sullivan 2021), and by individual citizens to drop items such as nails and makeshift explosives onto the properties of neighbors and ex-partners (The New York Times 2019; Dellinger 2019).

Concerns thus remain around both the drone's capacity to deliver harmful and 'hazardous materials to sensitive and protected targets' (Sims 2018, 99), and the suitability of traditional security measures, often focused on mitigating and countering land-based threats. Lastly, it is worth noting that alongside the direct infliction of harm, so too are drones associated with indirectly inflicting harm. For example, alongside a flag-carrying drone prompting a brawl at a 2016 Serbia-Albania football match (Jackman 2019b), when dozens of drones fell from the sky at a drone light show in China, spectators panicked and dispersed, jostling and 'scrambling for cover' (Sharma 2021). Such cases remind us that an unexpected drone or drone acting in an unexpected way can also prompt panic and fear.

3 Spaces of Innovation and Imagination

This section shifts to consider some emerging spaces of innovation and imagination which may inform an extension or expansion of the drone threats outlined above. As we have seen, drones have evolved to be "smaller, more affordable and more available" (Hurwitz, Olsen, and Barlow 2018, 3). Further, technological advancements continue in a range of areas, including capabilities and form, morphology, and intelligence. For example, while drones have traditionally been presented as 'low and slow' (Horowitz, Kreps, and Fuhrmann 2016, 16), the emergence of the 'second drone age' complicates this (Rogers 2021, 481). In the area of drone capabilities and form, drones are getting faster, with small drones designed for drone racing as capable of flying at speeds of over 100 miles per hour (Holland Michel 2019b). In addition to the challenges around 'intercepting small drones' in urban environments (Chávez and Swed 2020, 32), concerns have also been raised about the potential use of (multiple) small and fast drones

to overwhelm security or saturate airspace (Kallenborn, Ackerman, and Bleek 2022). Alongside developments in speed, both the drone industry and researchers alike have adapted drone form through the addition of appendages such as grabbing claws and origami arms enabling drones to pick up and release objects (Prodrone 2016; Potenza 2018). As Garett and McCosker (2017, 16) observe, while the drone has traditionally been 'considered an object looking out from its aerial position, it now more fully interacts' with its environment.

Developments are also occurring the area of drone morphology, which is 'not standing still,' but rather growing in 'variety' in terms of 'shapes and sizes' (Martins, Holland Michel, and Silkoset 2020, 16). Here, developments include the miniaturization of drones, which has challenged 'traditional thinking' around site defense which may be 'bypassed' by smaller devices (Birmingham Policy Commission 2014, 74). Here, we are urged to think about the 'urban' as 'multidimensional,' requiring security consideration in three-dimensional terms (Gisel et al. 2021; see also Jensen 2016). In addition, morphological development also includes designing biomimetic drones 'inspired' by nature, namely to look and move like particular animals (Johnson 2011, 11; Jackman 2021). As industry and researchers alike design bird-inspired drones, we are reminded that our assumptions about the 'typical' appearance of a drone should not be static, but rather dynamic, cognizant of drones that may appear less immediately visibly identifiable (Jackman 2021).

Thirdly, we are seeing advancements in the area of intelligence, such as the growing accessibility and availability of 'intelligent flight modes' which enable particular COTS drones with functions such as locking onto and following people and objects, and rapidly ascending or descending (Jackman 2019a). While marketed by drone companies as 'take off, target and go' to enable artistic shots, such capabilities have prompted concerns around their potential to be harmfully repurposed (Jackman 2019a, 368; see also National Academies of Sciences, Engineering, and Medicine 2018). Such developments are also indicative of wider advancements in Artificial Intelligence (AI). While it is argued that current generation drones remain "relatively unintelligent systems," concerns have nonetheless been raised around the potential for 'greater risks' to be ushed in as 'the performance of small drones is improved by advancements in AI' (Rogers and Kunertova 2022, 8). As Kreps (2021, 2) asserts 'autonomous drones offer additional advantages, allowing non-state users to preprogram drone activity in ways that make defense more challenging.'

Further, both 'multi-drone deployments' and 'swarming' are emerging as areas of advancement (Kallenborn, Ackerman, and Bleek 2022). Following developments in the military sphere (Scharre 2018), so too have domestic urban spaces witnessed the 'deployment of massed drones,' with over 3,000 flown 'in formation' in Shanghai to mark a company launch (Hambling 2021b). The possibility of deploying multiple drones for alternative means has prompted concerns around both the potential for multiple drones to 'saturate and overwhelm' sites and systems (Rogers and Kunertova 2022, 4), and the "vexing technical challenges" this poses from a "defensive perspective" (Mar-

tins, Holland Michel, and Silkoset 2020, 17). While swarming, namely the configuration whereby multiple 'small or large drones communicate, interact and respond in an autonomous manner,' remains complex (Rogers and Kunertova 2022, 4), it is nonetheless argued that a "swarm doesn't have to be dynamic or truly autonomous" to cause concern (Martins, Holland Michel, and Silkoset 2020, 18). For example, while 'mass flight remains distinct from a drone swarm' (Hambling 2021b), the utilization of multiple drones in attempts to target and overwhelm has been deployed by non-state actors to harmful effect at military sites and oil facilities (Rogers and Kunertova 2022, 4). As such, while recognizing the potential utility of drone swarms to combat the 'building problem' by offering real-time situational awareness to troops in urban conflict (Spencer 2017), concerns have nonetheless been raised around the potential of drone swarms to conduct 'chemical and biological weapons delivery' through 'releasing the agent' in a more targeted manner (e.g., at individuals or sites such as ventilation ducts, rather than 'spraying large masses of agent') (Kallenborn and Bleek 2019).

Lastly, as we saw in discussion of DIY innovation, citizens are also reportedly experimenting with such functionalities, using open source software in attempts to program multiple drones to detect their face and aim for their head (Cole 2018). Thus, as COTS drones 'proliferate,' at once readily accessible and 'incorporating increasing amounts of swarm-enabling autonomy,' diverse actors arguably get a 'vote' in the unfolding future of multi- and swarming drone deployments (Scharre 2015).

4 Potential Future Domestic Urban Drone Threats

Following the assertion that growing 'drone use in urban spaces opens a vulnerability gap to be taken seriously' (Rogers and Kunertova 2022, 2), this section reflects on some potential future domestic urban threats. Bringing together a reflection of emergent capabilities and their potential repurposing and exploitation in the urban domain, it outlines five potential forms of threat: data, disruption, overwhelming and distraction, deception, and destruction.

However, it first urges reflection not just on evolving drone capabilities, but on evolving airspace. While the 'drone landscape' has 'unquestionably altered over recent years' as drones are increasingly 'employed in civilian settings' (Rogers 2019; Abbott, Clarke, and Hickie 2016, 2), drone adoption and usage is nonetheless anticipated to increase further in the future. As such, in reflecting on potential future drone threats, it is pertinent to consider a context where authorized drones emerge as a core part of urban airspace. In this vein, a variety of global initiatives and trials are ongoing in the area of Unmanned Traffic Management (UTM), a system enabling the at-scale integration of 'legitimate' commercial and civil drones into domestic airspace through airspace segmentation and communication between aerial craft (Kuhn 2017). While noting its complexities, UTM anticipates a "premise and promise of shared and

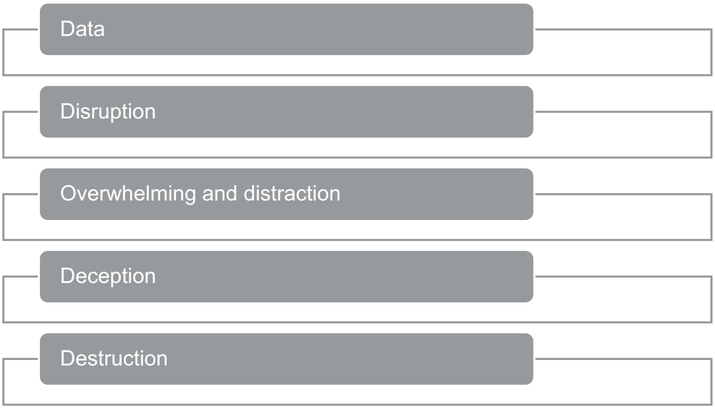

Figure 24.3: Typology of potential future domestic drone threats.

multiply-occupied" dronified airspace (Jackman 2022a, 8), one prompting concerns around "evolving drone risks in evolving airspace" featuring different users, competitions and congestions (Jackman 2019a, 373).

4.1 Potential Threat: Data

One area of potential future urban drone threat is around data. As we have seen, COTS drones have an established history as tools used to gather a view from above via optical cameras. However, alongside image and video, drones also capture "multiple types of data from a range of sensors" (Finn and Wright 2016, 577). Given that 'drones offer new ways of seeing and sensing,' we should therefore understand drones as both vision and 'sensing machines' (Garrett and Anderson 2018, 350). In this vein, it is first important to acknowledge that drone 'imaging systems or payloads vary greatly' (Garrett and McCosker 2017, 15), as does the variety of data types that can be collected (Finn and Wright 2016). Sensor payloads vary, from thermal sensors interested in the 'surface temperature of objects' (used to identify overheating equipment, in fire-fighting operations, and to assess damage and/or leaks to/from infrastructure), to multispectral sensors measuring the 'reflection of light energy off objects' (deployed to assess water/crop health) and hyperspectral sensors which capture 'detailed spectral data' (for debris detection, agricultural disease identification, and seepage from oil/gas infrastructure), to lidar, which captures elevation and structural data (Precision Hawk n.d.). In addition, drones have been outfitted with payloads such as microphones, both to listen out for other aircraft (Verger 2022), in search and rescue efforts, and to enable the 'recording of audio to gain an edge and elevate content to the next level' (DJI n.d.). While many such payloads have been designed and developed for deployment in diverse industries and applications, and as

such 'cost and form factors have been traditional barriers' of access, we are also seeing a number of 'companies releasing versions' of their sensor payloads 'for use on COTS drones' (Friese, Jenzen-Jones, and Smallwood 2016, 25).

As such, concerns have been raised around the potential for drone-enabled data collection to become "subject to function creep" whereby systems may be 'expanded' or modified to "include additional functions not originally envisaged" (Lyon 2007 in Finn and Wright 2016, 578). In this vein, potential sensor-enabled 'applications' which could be deployed by non-state actors in the misuse of drones have been identified. These include counter-concealment, surveying, surveillance, and navigation assistance (Friese, Jenzen-Jones, and Smallwood 2016, 25). Here, sensor-laden drones pose potential threats to sensitive, critical, and/or commercial infrastructure, which may be surveyed or surveilled to gather specific more-than-optical data to inform the targeting of particular points, sites, materials, or persons in a range of environments and conditions (lighting, weather etc.), thus potentially transforming sensor-laden drones into 'a game-changing viable threat' (Haider 2021, 42).

It is also worth noting that when considering the potential expansion of the drone's data-capturing capabilities, drones could also be paired with different software and components. Writing of the potential for drone-enabled targeting of crowds of persons, Rassler (2016, 61) raises concern about the pairing of drones with 'software enabling the discovery of large collections of people – perhaps based on their mass, heat, or digital signatures in an urban environment.' Similarly, alongside ongoing industry and police interest and experimentation in 'drone-based facial recognition' designed to identify and locate particular individuals (Brewster 2021; Ali 2021), we are also witnessing attempts at DIY drone-enabled facial recognition. In 2018 'YouTuber' Michael Reeves used open source software and off-the-shelf components in attempts to program several drones to "automatically detect his face and launch themselves at his head" (Cole 2018).

Lastly, attention is growing to the potential role of drones as cyber intelligence-gathering devices. While it is argued that presently "most terrorist organizations do not appear to have the capability to cause destructive cyberattacks," it is also suggested that this may change in the future (Kallerborn, Ackerman, and Bleek 2022, 19). Following that drones may 'present novel avenues for cyberattacks,' concerns have been raised about the potential utility of drones in the conducting of botnet ('stealth network infection enabled by mobile drones'), worm ('drone-injected worm' to take control of particular smart appliances), or 'man in the middle' data-gathering attacks (Best et al. 2020, ix, 2, 23). Here, drones may offer particular 'advantages,' such as "the ability to get close to a target or to create and access insecure networks" (Best et al. 2020, 24). As such, drones have been highlighted as potentially playing a role in the 'future of corporate espionage,' from "intellectual property threat" to "cyber-attacks" (Scott 2021, 3; Homeland Security 2017, 1). Following experimentation around the hacking of drones 'in controlled environments' (Jux 2021, 160), concerns have also been raised about using drones as hacking devices. This is reflected in instances whereby

modified COTS drones have been used ‘for hacking,’ with a drone ‘carrying wireless network-intrusion kit’ discovered on the roof of a ‘US East Coast financial firm’ (Claburn 2022). While it is asserted that this attack ‘had limited success,’ it nonetheless acted to highlight the utility of COTS drones as remotely piloted tools to attempt to ‘gain partial access to the company’s Wi-Fi network’ from ‘off-site’ (Claburn 2022). As urban areas become ‘increasingly congested, complex and interdependent’ (Gisel et al. 2021), while developments in the area of electronic conspicuity are explored and unfolding, distinguishing between authorized/legitimate and nefarious or unauthorized forms of drone-enabled data capture can nonetheless pose particular challenges.

4.2 Potential Threat: Disruption

A second area of potential urban drone threat is the deployment of drones to disrupt different contexts, spaces, and communities. As we have seen, drones have been deployed by protesters to disrupt sports events, political rallies and transport infrastructure alike (Abbott, Clarke, and Hickie 2016). In this vein, we may see drones deployed for disruption in wider spaces, sites, contexts, and capacities. Further, while the aforementioned drone disruptions have sought to disrupt at scale (i.e., to impact a high profile event or busy/congested site), so too have drones been used in attempts to target and disrupt the lives of individuals. Here, in a form ‘everyday droning’ (Jackman and Brickell 2022), drones have reportedly been used to stalk and harass women, disrupting feelings of safety and security (Dellinger 2019; Tourjée 2017).

Drone-enabled disruption may also be amplified through the use of livestreaming applications, with a number of COTS drones enabling users to broadcast footage live to social media to be widely viewed, commented up, and shared (Jackman 2019a). This links to a wider potential threat around disruption via drone communications. In addition to drones being used as propaganda tools (Archambault and Veilleux-Lepage 2020), so too may they be used in the wider delivery of messaging. For example, alongside artists experimenting with drone-delivered crowdsourced graffiti (Katz 2019), leaflet-dropping drones have been used by both activists protesting military surveillance (Coldewey 2015), and in the perpetration of antisemitic hate (Morran 2019). In this vein, drones have been used in number and formation as tools to communicate political messages and/or messages to political leaders. In 2021 environmental activist organization Greenpeace deployed 300 drones in Cornwall in proximity to the G7 Summit “to create moving images of animals” with the aim of “calling on world leaders to ‘act now’ to tackle climate change” (ITV News 2021). Here, we see precedent for the potential use of drones as communication tools seeking to disrupt sites, communities, and/or political agendas. Given the status of the ‘urban’ as a ‘core hub of people, power, economic activity, social institutions, history, and culture,’ the potential disruption of urban space thus holds a ‘strategic value’ (Gisel et al. 2021), one leading drone scholars to assert that the “possibility of other drone-related incidents might be

regarded not so much as a matter of 'if' but 'when'" (Martins, Holland Michel, and Silkoset 2020, 7).

4.3 Potential Threat: Overwhelming and Distraction

A third area of potential drone threat is the use of drones to both overwhelm and distract at urban sites, spaces, and security activities. Here, it is pertinent to note that drones have been used in attempts to overwhelm policing operations, with the Federal Bureau of Investigation (FBI) reporting that criminals used drones to 'swoop' by with 'high-speed low passes' to flush agents out and disrupt their 'situational awareness' (Tucker 2018). As such, concerns have been raised that multiple drones may be flown at sites or persons in efforts to overwhelm or confuse security process and provision. As the FBI continues, drones 'render traditional, two-dimensional security measures' largely 'ineffective,' enabling 'unobtrusive degrees of access' (Brunner 2018).

In this vein, concerns have been raised around the use of multiple and/or swarming drones to overwhelm. While the potential 'scale of a multi-drone attack could vary significantly' (Kallenborn, Ackerman, and Bleek 2022, 1), flown in volume, drones could be deployed to deliver/drop small yet multiple (seemingly) offensive payloads. Here, multiple drones may prove more difficult to down, or prompt a dangerous rush of crowds/people seeking to escape ambiguous dropped materials (Rassler 2016; Martins, Holland Michel, and Silkoset 2020; Friese, Jenzen-Jones, and Smallwood 2016). Lastly, the FBI add that the presence of multiple drones 'in the vicinity of an emergency' may also 'impede response operations' (Brunner 2018). Thus in their overwhelming of airspace, unanticipated drones at a site may have a range of potential consequences.

Further, concerns have been raised around the potential to deploy drones as tools to distract, flown in a particular place or direction in order to draw attention to that point, while something else – such as a violent or criminal action – occurs elsewhere. For example, a drone outfitted with a smoke emitter would draw considerable attention (Spencer 2017) and may enable the creation of a 'cloud' to obscure and prevent a views around an actor. While flown in a 'nonviolent' capacity, such 'diversionary devices' could however be used "to channel a crowd to another location where attackers could be lying in wait" (Rassler 2016, 12).

Alternatively, we might see drones used as a tool to proactively distract people undertaking an act – such as driving or security provision, raising potential safety and/or security issues. Here, research exploring 'the distance from the edge of roadway at which drone operation around highway corridors may become a visual or cognitive distraction, degrading driving performance' concluded that "drone operations do pose a potential distraction, and this potential varies based on the characteristics of the environment in which the drone is flown" (Hurwitz, Olsen, and Barlow 2018, 1,

Figure 24.4: Drone. Credit: Miki Yoshihito. Source: https://www.flickr.com/photos/mujitra/19440078509/ (no permission required, CC BY 2.0).

61). It is possible, then, that the drone's distracting qualities – be they visual or aural (Schäffer et al. 2021; Jackman 2022b), could be weaponized.

4.4 Potential Threat: Deception

A fourth area of potential threat is that of deception via drone. Deception could take a number of forms. First, if we return to the notion of airspace as evolving through the emergence of Unmanned Traffic Management enabling the integration of drones into (urban) airspace at scale, we may anticipate seeing drones as more present and active in our skies. As authorized or 'legitimate' airspace users increase, concerns have been raised that "this evolving airspace condition could be exploited" (Jackman 2019a, 373). This might involve a "nefarious user" mimicking legitimate use (copying/duplicating flight patterns and platform markings) in a bid to "cause confusion" in plain sight (Jackman 2019a, 373), or indeed hijacking/taking them over. Here, drones have already been used as tools to interfere with authorized drone operations. For example, in 2022 an artist's studio scheduled a "four-day drone performance" at a concert hall in Germany, which was "cut short after attacks by unidentified drones" which "knocked some of the performance drones out of the sky" (Jordahn 2022).

Further, leading on from the earlier discussion of shifting drone morphology, as drones continue to develop in shape and form, struggles may be possible around recognizing their typical appearance and movement, though it should be noted that this remains contingent on the roll out of particular forms of airspace management (e.g. electronic conspicuity). For example, in the case of biomimetic drones inspired by birds, in-

sects, bats, and fish and designed to blend into their environments, security challenges may accompany the advent such forms of camouflage (Jackman 2019a, 2021). Developed by industry and experimented with by hobbyists alike, the deployment of such biomimetic platforms may be utilized in attempts to surveil or target people below in order to deceive those who may not be aware of the platform's presence.

Concerns have also been raised around other forms of ambiguity. For example, researchers have highlighted the potential for drones to deceive via their outfitting with an ambiguous payload and overflight over a crowd or event space. Here, researchers have noted that even if 'ineffectual' or 'inert,' an ambiguous payload remains a threat, with anything dropped from a drone "giving the impression" of a harmful attack being enough to potentially "cause mass panic" and injuries via a crowd stampede (Friese, Jenzen-Jones, and Smallwood 2016, 29; Martins, Holland Michel, and Silkoset 2020).

Lastly, in considering ambiguity in the context of shifting airspace, we can also note that what some consider to be 'legitimate' drone use and operations now may shift over time. For example, there have already been several experiments with authorized disciplining and weaponized drones. For example, the global COVID-19 pandemic saw a flurry of attention to the potential of drones as tools acting at a distance in a context of social distancing. Alongside their deployment in the delivery of medical supplies and the disinfecting of spaces, drones were also deployed as surveillance and monitoring tools by a number of police forces globally (Martins, Lavallée, and Silkoset 2021). For example, using drones as tools to 'enforce quarantine rules and deter gatherings that violate social distancing rules,' officials outfitted drones with loudspeakers to 'scold' those 'not wearing a mask,' 'to order people home and break up mahjong games' (Richardson 2020). In the case of weaponized drones, this has also included the Iraqi Federal Police's use of armed drones against the Islamic State (Waters 2017), the Israeli Police's use of drones to drop tear gas on Palestinian protesters (Breiner 2018), a Chinese power company using drones outfitted with flame throwers to remove trash off of power lines, and a South African company supplying pepper spray drones to an international mining company (Enemark 2021). Here, we may see that efforts to securitize, govern and conduct policing and corporate activities via drone may inadvertently act to inspire malicious and deceptive innovation (Jackman 2019a).

Collectively, such potential threat vectors highlight challenges surrounding the 'distinguishing of (il)legitimate drone use,' particularly in the context of increasingly busy urban 'RF spectrum' backgrounds (Pyrgies 2019).

4.5 Potential Threat: Destruction

The final area of potential urban drone threat comes in the form of destruction. While the advent of drone-enabled destruction and harm through the weaponization of platforms has been discussed, we may in future see drones deployed in more var-

ied forms of destruction. In addition to the use of weaponized drones targeting military, critical, sensitive or transport infrastructure with explosive materials or via a kinetic strike (Martins, Holland Michel, and Silkoset 2020), we may also see destruction targeting different scales. For example, following the military-led development of small 'urban combat drones' designed to 'breach urban defenses' by 'navigating indoors, locating and identifying targets, and opening fire' (Mizokami 2020), we may see smaller, faster drones flown to/at small sites (such as ventilation ducts) and individual people/residences (Kallenborn and Bleek 2019). Such forms of smaller scale targeting may act to "heighten the psychological impact" of a drone attack by 'signaling that no-one and nowhere is safe' (Kallenborn, Ackerman, and Bleek 2022, 14).

Such forms of attack may also be amplified through the pairing of weaponized drones with advancements in navigation and intelligence. Here the wider context of military-initiated 'technological advances' in the area of "drones that can operate in GPS-denied environments" (Holland Michel 2019a, 10) is important, as it may act to shift and strengthen the navigational ability of drones more widely in the future – for example enhancing drone navigation indoors. After all, it remains that while "Global Navigation Satellite Systems (GNSS) such as the Global Positioning System (GPS) have become one of the most dependable solutions for position and navigation," in 'operational' contexts such as the urban environment "GNSS may be unavailable, sparsely available, or significantly deteriorated" (De Haag 2022). As such, while cognizant of existing limitations (Holland Michel 2019b), advancements in navigation may enable an alternative engagement with the "microgeographical landscapes of streets, buildings, tunnels and cities" (Graham 2010, 218), with such contours of the urban environment acting as an 'amplifier' to drone misuse (Konaev 2019, 40).

Further, we may also see developments in the drone-enabled delivery and dispersal of harmful and hazardous materials. While drones have been used in both attempts and actions to distribute radioactive material (Friese, Jenzen-Jones, and Smallwood 2016; Kallenborn, Ackerman, and Bleek 2022), concerns have been raised around the wider potential of "drones to distribute chem-bio materials" (Rassler 2016, 59). Following that existing authorized and legitimate drone users deploy drones in an "analogous way" in both the agricultural dispersal of pesticide chemicals and the aerial dispersal of disinfectant in the Covid-19 pandemic, concerns are raised that a malicious party may "use this same concept to spread a lethal agent over a crowd" (Rassler 2016, 59; Martins, Lavallée, and Silkoset 2021). While acknowledging the difficulties associated with 'carrying out' such an attack (Rassler 2018, 22), we can also look to the DIY community who have outfitted drones with a range of creative dispersal mechanisms – from graffiti to candles, which have the potential to be 'reimagined' otherwise (Jackman 2019a).

As writing on urban warfare reminds us, conflict in the urban sphere risks both the safety of populations and the damage of 'critical infrastructure necessary to supply vital services' upon which they depend, thus rendering urban lifeworlds as 'inherently vulnerable' (International Committee of the Red Cross n.d.).

5 Conclusion

This chapter examined the current and potential threats associated with commercially-available off-the-shelf (COTS) drones, assessing their implications for (evolving) domestic urban locales. In so doing, it first provided a typology of four key current urban drone threats, those spanning: the view from above, the drone's carrying capacity, the use of the drone as a tool for disruption, and the drone's damaging and harmful weaponization. While recognizing the utility of drones in a growing range of economically and socially beneficial applications, it highlighted "records of drone incidents by 40 non-state actor groups covering every continent expect the Antarctic" (Chávez and Swed 2020, 28) while exploring the challenges posed by their advent.

In exploring the drone and drone threat as evolving (Edwards 2022), it turned attention to some spaces of innovation and imagination, highlighting several contours along which drone capabilities are advancing, including form, morphology, and intelligence. It demonstrated that like drones, drone threats are evolving, 'posing new challenges' for their countering (Holland Michel 2019a, 10). Here, it centrally sought to emphasize the drone's malleability. For example, while many advancements discussed are designed and premised to enable "new ways of doing things" (Serafinelli 2022, 1377), in seeking, for example, to 'create a more resilient' and safe link between operator and craft, features such as 'frequency-hopping' simultaneously present challenges to counter-drone systems (Holland Michel 2019a, 10). As such, as drones emerge as increasingly popular craft for commercial, civil, and recreational use, so too does their growing capability raise critical questions for the security of the urban domain. Following that urban environments are 'set to face evolving threats from the skies' (Rogers 2021, 499), the chapter's final substantive section thus outlined a range of potential future domestic urban drone threats. Unpacking a typology of five potential threats (data, disruption, overwhelming and distraction, deception, and destruction), it reflected on changing drone capabilities in the context of shifting airspace. It sought to demonstrate that as airspace changes, new potential urban drone threats may pose and raise alternative 'defensive challenges' for urban spaces and 'security providers' alike (Chávez and Swed 2020, 28).

In closing, while cautioning against the assumption of simple or automatic disruptive or malicious drone adoption, the chapter has highlighted some potential affordances of available and accessible COTS drones, recognizing that like the platforms themselves, (potential) drone threats are multiple, varied, and at times ambiguous. Thus, in continuing to reflect on drone threats as 'multi-faceted' (Martins, Holland Michel, and Silkoset 2020, 37), we can close with several areas designed to prompt further consideration. First, how and where might we add to these typologies of (potential) domestic urban drone threats? Here, further attention is needed to the diversity of urban landscapes, which 'vary widely throughout the globe' – from high-rise buildings to 'relatively isolated single dwellings' (Watkins et al. 2020, 9). Second, in reflecting on how to comprehensively approach (future) forecasting of (potential) urban drone threats, what sources, sites, and expertise should we be viewing and engaging? Here, we might reflect further on how, as research-

ers and practitioners, we methodologically and empirically approach the issue of drone threat. Lastly, how might we engage meaningfully with drone threat as evolving in the context of shifting urban airspace seeking to integrate drones at scale? Here, it remains pertinent to consider temporality in our analysis; alongside drones themselves, airspace is shifting and with it our perceptions of what the sky of the future may look like require revisiting. This chapter has sought to offer one pathway to do so.

Seminar Questions

1. How have drones been misused or abused in domestic urban centres?
2. How might we group such examples of drone misuse or abuse?
3. How are drones altering the ways we think about and respond to risks and threats in cities today?
4. How might drones change notions of risk and threat in the future?
5. How might changing cities impact the ways we think about drone risks and threats in the future?

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Ingvild Bode and Anna Nadibaidze

25 Autonomous Drones

Abstract: Advances in artificial intelligence (AI) have been inspiring ongoing debates about the application of AI-based technologies to increase the level of autonomy in weapon systems, including in aerial drones. In 2021, a United Nations report suggested that a drone was used in a fully autonomous mode – without human supervision after activation – to attack targets in Libya. Drones integrating autonomous technologies have been proliferating for some time and have been used in several armed conflicts. Militaries are increasingly interested in developing and acquiring loitering munitions, swarming technologies, and larger models of autonomous drones. In this chapter we explore developments in each of these areas. We also consider the perceived advantages of autonomy in drones and the challenges associated with practices in relation to weapon systems incorporating autonomous and AI technologies, especially in terms of human-machine interaction and the quality of human control over the use of force in warfare.

Keywords: Autonomy, artificial intelligence, loitering munitions, swarming, autonomous weapon systems

In March 2022, the United States (US) revealed that 100 Switchblade[1] drones would be part of their latest military donation to Ukraine (Macias 2022; McLeary and Ward 2022). The announcement drew significant media attention because the Switchblades, like many other types of loitering munitions, are said to include autonomous technologies in targeting. Loitering munitions represent the latest systems in a longer history of drones with increasing autonomy in their targeting functions. Autonomy can be broadly defined as the "ability to perform a task without human input" (Scharre and Horowitz 2015, 5). It has been integrated to support many functionalities of drones, such as navigation and flight. Platforms manufactured and used by the US, such as the Global Hawk, are, for example, capable of autonomously performing take-off and landing, as well as following a pre-programmed flight path (Enemark 2014, 101).

However, considering technological advances in artificial intelligence (AI), the increasing inclusion of autonomy in targeting has been raising debates and fundamental questions about the extent to which humans remain in direct, immediate control over the use of force. Therefore, this chapter focuses specifically on drones integrating autonomous technologies in targeting. It provides an overview of autonomous drones in four steps: first, it explores loitering munitions as one type of drones incorporating

1 It was later stated that these were Switchblade-300s, the smaller of the two available variants that weighs around 2.5 kg, carries a fragmentation warhead, has an operational range of 10 km, and an operational endurance of 15 minutes (Atherton 2022).

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autonomous technologies in significant ways that sees considerable proliferation. Second, it examines advances in swarming capabilities, and third, the development of larger autonomous drones. Fourth, it concludes by reviewing drivers associated with the proliferation of autonomous drones and problems raised by this development.

1 Loitering Munitions and Their Proliferation

Loitering munitions are "expendable uncrewed aircraft which can integrate sensor-based analysis to hover over, detect, and explore into targets" (Bode and Watts 2023, 3).[2] It is useful to think of a loitering munition as a hybrid between an uncrewed aerial vehicle (UAV) and a missile (Gettinger and Holland Michel 2017, 1; Trevithick 2021). Like missiles, loitering munitions "engage beyond line-of-sight ground targets" and are designed to be expendable with the completion of the mission, meaning that they often self-destruct when attacking a target (Gettinger and Holland Michel 2017, 1). Unlike missiles, many models of loitering munitions are not fired at a specific target, but loiter over the battlefield searching, within a potentially broad geographical area, for a particular class of target that they identify via sensors and feature/object recognition (Atherton 2022). There is significant uncertainty around the quality of control human operators can exercise when using loitering munitions (Bode and Watts 2023, 4). Many manufacturers characterize loitering munitions that they produce as 'human-in-the-loop' systems that can be retrieved and reused if they are unable to find a target. This means that their human operators must visually verify targets and authorize attacks and can also typically abort an attack while it is already underway. At the same time, promotional material about loitering munitions often advertises that such systems are capable of operating in GPS-denied environments, suggesting that the human operator may not have the possibility for visual verification (Bode and Watts 2023, 24).

The development of loitering munitions started in the 1980s with larger platforms designed to attack radar installation and mobile air defense systems or launchers (Gettinger and Holland Michel 2017, 1; Gao 2019). A prime example of this type is the Harpy, manufactured by the Israeli company IAI and often described as the first loitering munition. The Harpy is also regularly discussed as meeting the definitional requirements of a fully autonomous weapon system, according to the International Committee of the Red Cross (ICRC)'s definition[3] (Horowitz 2016, 2; Scharre 2016, 19; Congressional Research Service 2021, 1). IAI themselves describe it as an "autonomous weapon for all weather" and as a "'fire and forget' autonomous weapon" (IAI n.d.).

2 This section draws on information previously published in Bode and Watts (2023).

3 The ICRC defines autonomous weapon systems as systems which "select and apply force to targets without human intervention" (International Committee of the Red Cross 2021).

From the mid-2010s onwards, we have seen an increasing range of loitering munitions of varied sizes. Some of these are smaller, lighter, and portable systems designed for infantry use to attack adversarial soldiers as an alternative to conventional mortars. In contrast to the earlier dominance of Israeli manufacturing, there is a broad array of companies based in states such as Russia, Taiwan, Turkey, and the US producing these platforms. The Kargu-2, manufactured by Turkish company STM, is a quadcopter which takes off and lands using its own rotary power. It can reportedly be armed with thermobaric, anti-personnel, and armor-piercing warheads weighing up to 1.3 kg and is advertised as being designed for asymmetric warfare or anti-terrorist operations (STM 2021). A June 2020 STM press release states that the Kargu-2's development had "benefited greatly from field use," having been reportedly deployed by the Turkish military along the Turkish-Syrian border in 2019 (STM 2020). The Kargu-2 rose to international prominence in 2021 following the publication of a report authored by a United Nations Panel of Experts about the Libyan Civil War (UN Security Council 2021). This report alleged that in March 2020, the Kargu-2 and "other loitering munitions [. . .] were programmed to attack targets without requiring data connectivity between the operator and the munition: in effect, a true 'fire, forget and find' capability" (UN Security Council 2021, 17).

There is a significant gray zone in assessing the extent to which loitering munitions can operate autonomously in targeting. On the one hand, many models of loitering munitions proliferating today appear to have the latent technological functionality to identify, track, and attack targets without human intervention (Bode and Watts 2023, 10). This means that they rely on sensors, processors, and software for targeting decisions. Such software "remains developmental and errors and shortcomings [. . .] could result in strikes that do not hit the intended targets" (Gettinger and Holland Michel 2017, 4). On the other hand, the systems' manufacturers argue that they are used in manual mode, that is with a 'human-in-the-loop' when selecting and attacking targets (see Table 25.1 for different levels of human involvement in the control loop). Yet, even if we accept that they will be operated with a 'human-in-the-loop,' the quality of that human control could still be adversely mediated. Human control in a specific use of force decision necessitates the

Table 25.1: Levels of human control in the loop for decisions on the use of force (based on Bode and Huelss 2022, 163; Sharkey 2016).

Human in-the-loop	The system requires human input. Humans deliberate about targets before initiating an attack and choose from a list of targets or a course of action suggested by the system.
Human on-the-loop	Humans oversee and supervise the system. The system selects the calculated targets but needs human approval before the attack. For example, the system can allocate humans a time-restricted veto before the attack.
Human off-the-loop	The system selects the targets and initiates the attack without human involvement or intervention.

capacity to critically scrutinize machine prompts (Bode and Watts 2021). Under combat conditions, it is unclear whether soldiers have the critical decision-making space and necessary situational awareness to engage in this scrutiny (Bode and Watts 2023).

Notwithstanding such uncertainties, loitering munitions are proliferating. According to Gettinger's estimates, while only ten states manufactured loitering munitions in 2017, in 2022 that number has more than doubled to 24 (Gettinger 2022). Such platforms have been used in major military conflicts since the late 2010s, such as the wars in Iraq, Libya, Nagorno-Karabakh, Syria, and Ukraine. Policy discourse about the use of loitering munitions in some of these conflicts, in particular Nagorno-Karabakh, celebrates their military effectiveness (Gressel 2020; Shaikh and Rumbaugh 2020). In addition, loitering munitions could be used in a variety of domains and not only in the infantry contexts they are often associated with (Rogers and Kunertova 2022). They can, for example, be hosted on warships or larger drones. These appear to be ideal conditions for their proliferation. At the same time, the international debate about potentially regulating autonomous weapon systems at the United Nations Convention on Certain Conventional Weapons (CCW) in Geneva remains bogged down by definitional disputes and recalcitrant states parties (Nadibaidze 2022). Practices of using weapon systems with autonomous features, such as loitering munitions, already do and will continue to outpace deliberations on international regulation (Bode 2023). Proliferation dynamics may lead to a further rush to these systems without thinking through their adverse implications for the conduct of war. As a result, the presence of loitering munitions in war is gradually being normalized.

2 Drone Swarms: The Future of Warfare?

In addition to demonstrating interest in loitering munitions, militaries around the world explore how technological advances can be applied for coordination between weapon systems operating in a swarm, whether in the air, on the ground or underwater, or combined all together. Drone swarms are composed of several individual uncrewed vehicles which share an objective and operate as a coherent entity. While they are not necessarily all fully autonomous, drones part of a swarm can communicate with each other without direct human intervention to "react to the battlefield as one at machine speed" (Scharre 2018). A swarm is not defined by the use of multiple drones simultaneously, but by internal coordination and collective work. The drones transfer data between each other and work together to navigate through the environment, inspired by similar formations in nature, such as swarms of insects, schools of fish, or flocks of birds. However, unlike natural swarms which do not rely on central control, current robotic drone swarms are directed by a human operator. The operators "steer (subsets of) the swarm collectively" rather than controlling each individual element (Verbruggen 2019). Moreover, groups of animals in nature are usually uni-

form, while drones that are part of the swarm can be of diverse sizes and possess distinct roles, including combat, reconnaissance, intelligence gathering, and communication. Current swarming technologies mostly integrate smaller drones with more or less equal capabilities (Kallenborn and Bleek 2018). At the same time, major developers of military AI and robotic systems have been experimenting with swarms of dozens and potentially hundreds of drones (Rogers and Kunertova 2022, 4).

It is challenging to evaluate the state of swarming technologies, not least because many research and development projects in this area are kept secret. However, the interest in applying swarming tactics to drones can be found around the world. While swarms are not yet part of the battlefield, they are often said to have the potential to fundamentally "change" modern warfare (Scharre 2018; McMullan 2019). Drone swarms could integrate AI applications such as computer vision and speech recognition, as well as algorithms in decision-making to carry out surveillance, reconnaissance, locating targets (including nuclear missiles), as well as intelligence and data gathering missions (Johnson 2020a; Scharre 2014). Advances in the sphere of AI and computer science are expected to enable swarms of drones "to accomplish a much larger variety of missions than individual human pilots" (Johnson 2019, 151). Military officials and analysts argue that drones are more efficient and quicker at processing information, and that having a human operator behind each drone is costly and time-consuming (Scharre 2015). Swarms are perceived as a relatively low-cost way of launching coordinated attacks or maneuvers to deceive enemies, an effective method to bypass air defense systems, overwhelm enemy forces with large numbers of vehicles, as well as assist in delivering both conventional and nuclear weapons (Johnson 2020b). Swarming tactics applied to drones could provide a strategic advantage in offensive operations, as it would take time for the enemy to shoot down every drone in a swarm, allowing at least some of them to complete the mission. Analysts also note that swarms could be a cheaper and more efficient alternative to single UAVs (Lachow 2017). Based on these perceived operational advantages, many major developers of military technologies have been busy working on, and demonstrating, their swarming tactics and technologies.

In May 2021, Israeli Defence Forces used a swarm of reportedly small and relatively simple drones, in coordination with ground-based missiles, to "locate, identify and strike" Hamas militants in the Gaza Strip. The incident was described by experts as the first use of drone swarms in combat (Hambling 2021; Kallenborn 2021). During the 2022 Experimental Demonstration Gateway Exercise, the US armed forces tested a series of drone swarms called the Wolfpack, describing it as the largest interactive swarm it has ever tested (Guckeen Tolson 2022; Parsons 2022). Meanwhile, in 2021 the United Kingdom (UK) armed forces tested swarms of medium and heavy UAVs which were "tasked independently to find and identify enemy targets, accurately using their range of increasingly powerful sensors and target acquisition algorithms" (Royal Navy 2021). The Chinese remotely controlled vessel Zhu Hai Yun, unveiled in 2022, would be "the world's first drone carrier capable of operating on its own" and is described by media as a symbol of China's ambitions in deploying drone swarms for

maritime surveillance which would be launched from this ship model (Saballa 2022; Xie 2022). The Russian Ministry of Defense is also actively supporting swarm research and development. It announced plans for the Su-57 fifth generation fighter jet to coordinate with the S-70 Okhotnik UAV in squadrons with the help of "AI elements" (Bendett 2021; Lavrov and Ramm 2021). Such trends suggest an increasing proliferation of swarms of drones and exploration into how they can be used in conjunction with other uncrewed and crewed systems. Moreover, many producers of loitering munitions are working on their platforms' swarm capabilities: manufacturers of at least ten systems currently in use promote their development in the context of swarming (Bode and Watts 2023).

However, the proliferation and increased use of swarming technologies raises uncertainties and concerns, especially about the capacity of humans to remain in control over decision-making and the use of force. Can we trust drones to 'learn' from data they collect and react in a way that is predictable and in accordance with the swarm's mission, especially in a rapidly evolving conflict situation? It would be difficult for human operators to remain in full control of a swarm, continuously communicate with it, and know what it does and how it could react to the changing dynamics in the surrounding environment (Verbruggen 2021). Presently, militaries affirm their intention to maintain human control over drone swarms or any other weapon systems. But as the development of swarms progresses, we may quickly get into situations where a single human operator will be responsible for a swarm of platforms. This creates a significant strain on the 'human-in-the-loop' guarantee and alters the overall predictability of the systems, as swarm behavior may not be fully foreseeable nor understandable to the humans in charge (Bode and Watts 2023). Moreover, with the technological challenges in making swarms function as planned, the perceived advantages might not come to reality (Shmuel 2018). For instance, experts warn about the security implications of drone swarms, in particular the capability of enemies to hack into communication networks or sensors, as well as launch adversarial attacks to fool the algorithms which interpret the data collected via sensors (Holland Michel 2021).

3 Autonomy in Larger Drone Models

Several states have been working on integrating autonomous capabilities into larger drone models, which are still under development. One such model is the Taranis, a prototype combat drone, also referred to as a tech demonstrator, manufactured by the UK's largest security and aerospace firm BAE Systems with financial support from the UK Ministry of Defence (Burt 2018; Doward 2018). It was unveiled in 2010 and branded by the UK Government as "vitally important for the future of both UK air defence and the UK defence industry" (Hoyos 2014). Taranis' producer describes it as "a complement to manned aircraft" and highlights that the drone, "under the control

of a human operator, can undertake sustained surveillance, marking targets, gathering intelligence, deterring adversaries, and carrying out strikes in hostile territory" (Ingham 2016; BAE Systems n.d.). At the same time, the UAV can reportedly perform some functions without human input, including air operations as well as target selection and engagement, which would categorize it as an autonomous weapon system (Cole 2016; Boulanin et al. 2020, 57).

Meanwhile, the US Air Force is developing the Skyborg program, defined as an "autonomous aircraft teaming architecture that will enable the Air Force to posture, produce and sustain mission sorties at sufficient tempo to produce and sustain combat mass in contested environment" (The Air Force Research Laboratory n.d.). The program's main objective is to support cooperation and coordination between UAVs and crewed planes within combined swarms with the assistance of AI-based systems (Tirpak 2021). Skyborg's autonomy core system (ACS) aims to increase levels of autonomy and enable drones to accomplish increasingly more tasks without direct human supervision (Osborn 2022). The Air Force has already conducted a test flight of a UAV controlled by the ACS over Florida and the Gulf of Mexico, and reportedly expected Skyborg to be ready for operations in 2023 (Mayer 2021; Mizokami 2021). As in the Taranis case, the Skyborg framework is described as assisting rather than replacing human pilots by "provid[ing] them with key data to support rapid, informed decisions" (Larson 2021).

In sum, reports about the further development and testing of loitering munitions, swarming, and autonomy in larger drone models raise discussions about the perceived opportunities and problems brought by autonomy in drones and weapon systems more broadly. We explore these debates in the next, concluding section.

4 Drivers and Problems

The increasing development of autonomous drones can be associated with three sets of factors that also drive the overall integration of autonomous technologies into weapon systems: strategic, operational, and economic (Boulanin and Verbruggen 2017, 61–63). First, strategically, military powers such as the US, China, and Russia are identifying autonomy in weapon systems and military applications of AI as foundational to their security strategies and future competitiveness (Haner and Garcia 2019). The weaponization of AI therefore plays a pronounced role in renewed great power competition – not 'naturally' or by necessity, but because the major military powers have chosen this positioning. Second, on an operational level, military planners hold that integrating autonomy into targeting gives militaries the means to improve their war-fighting ability by increasing speed, precision, and endurance. Military applications of AI are supposed to make the battlespace more legible, facilitate the identification of adversaries, and thereby increase operational control (see, for example, National Security Commission on Artificial

Intelligence 2021). Some experts argue that loitering munitions and swarming technologies will, or already are, part of the modern battlefield and hold benefits which deserve to be invested in further. Autonomy in drones is said to address the vulnerability of communications between the human operator and the system, as the communication link can be "jammed or hacked" (Anderson and Waxman 2013, 7). The ability to select and identify targets based on algorithmic models is also often described as more precise "due to persistent stare [constant video surveillance that enables more time for decision-making and more eyes on target]" (Arkin 2013, 1). This argument is often used to justify autonomy from a legal point of view and to support the belief that a precise weapon system with autonomous features would be better at discriminating between legitimate and non-legitimate targets (e.g., civilians vs. combatants in warfare), a key requirement of international humanitarian law (IHL) which governs armed conflict.

Third, economically, integrating autonomy has become associated with reducing the financial costs of weapon systems, not only in terms of purchasing expenses but also of running costs. While autonomous drones initially require significant resources from design, testing, to deployment, they may turn out cheaper, both financially and politically, than pilot-flown fighter jets. This is especially the case for the ever-smaller and lighter autonomous drones: a Switchblade-300 unit has been estimated to cost as little as $6,000, making them significantly cheaper (and therefore more expandable) than the AGM-114 Hellfire missiles ($100,000) that MQ-9 Reaper drones ($56 million) fire (Atlamazoglou 2022). Loitering munitions and swarming technologies are perceived as a relatively low-cost, low-risk way of efficiently bypassing air defense systems and attacking tank convoys. Within the context of the Russian full-scale invasion of Ukraine, for instance, some analysts have argued for supplying Ukrainian armed forces specifically with these types of drones and for these reasons (Jensen 2022).

Reversely, the development of increasingly autonomous drones comes with at least three significant problems and obstacles of a legal, ethical/normative, and technological nature.[4] First, IHL sets general boundaries that all new weapon systems, including autonomous drones, must be used in adherence to (Crootof 2015). These include fundamental principles such as distinction between civilians and combatants, proportionality, and precaution (Laufer 2017; McFarland 2020; Mauri 2022; Seixas-Nunes 2022). Adhering to these principles requires militaries to retain human control and oversight, in some form, over autonomous drones not only because international law is addressed to human beings (Walsh 2015; Brehm 2017), but also because such principles necessitate deliberative human judgment. Technical AI and robotics experts have long warned about the relative 'stupidity' of AI when it comes to distinguishing between civilians and combatants (Sharkey 2016). While military objects, such as tanks, planes, and ships have become machine-recognizable, differentiating between human beings as civilians and combatants is near impossible to achieve for an AI-based system (MacDonald 2021). This

4 This section draws upon Bode and Huelss (2022, chapter 1).

is not only because how human beings approach these categories cannot be made amenable to machines, but also because distinguishing between civilians and combatants requires deliberative, context-dependent judgment (Suchman 2016). This is more severe in a cluttered space, such as an urban environment. The significant legal uncertainties surrounding the use of autonomous weapon systems in general have been the subject of a lengthy international debate under the auspices of the CCW – a process that may yet lead to the negotiation of new specific international law (Bode and Huelss 2022, 30–40).

Second, autonomous drones raise fundamental ethical-normative questions about delegating use of force decisions to machines. Scholars put forward deontological arguments that underline the need for human judgment in the use of force, often centered on the notion of human dignity. The notion of human dignity is supposed to serve as a benchmark for policy, arguing that autonomous drones and other autonomous weapons are not able to “understand or respect the value of life” and therefore “render any lethal decisions arbitrary and unaccountable” (Sharkey 2019, 82–83). There are also arguments associated with consequentialist ethics that consider whether the integration of autonomy into weapon systems has the potential to lead to a more ‘ethical’ way of conducting warfare (Anderson and Waxman 2013). Contributors to the debate also argue that ethics cease to be about complex moral questions and instead come to be perceived “as a mere technical problem” (Schwarz 2019, 25). In general, specialists in computer science and robotics agree that algorithms are not able to conduct the same moral reflections as humans, which are required in warfare, especially when it comes to taking other humans’ lives. Their integration into drones is perceived by many as a worrying trend, as is delegating life and death decisions to machines which do not have the same moral agency as humans.

Third, deploying autonomous drones on the battlefield comes with significant uncertainties as to how reliably and predictably the technologies animating such systems can function in complex and dynamic environments (Holland Michel 2021). AI-driven targeting is uncertain because AI is famously brittle (MacDonald 2021; Kallenborn 2022). This means that it can be fooled into making mistakes easily, for example via adversarial attacks. These can be conducted in the physical space by adding small alterations to physical objects or by adding changes in pixel, digital noise that is imperceptible to the human eye (Huelss 2022). Such alterations can convince an AI system that a military target is something else – or the reverse. Target identification is a particular worry in a complex urban battlefield because of the ways in which it creates risks for civilians and friendly soldiers (Kallenborn 2022).

In sum, we are at a crucial moment in terms of proliferating autonomous drones as there are increasing calls for military expenditure in this sphere, while systems that had only been in development are being rushed out, as the US delivery of 121 experimental Phoenix Ghost loitering munitions to Ukraine suggests (Finnerty 2022). In the grand scheme of things, the extent to which drones include autonomous and/or technologies in targeting may not seem to matter much when these weapons appear to be effective in countering adversaries. However, these trends raise concerns be-

cause, as no boundaries are drawn and practices are less scrutinized, human control over the use of force may be incrementally and silently ceded.

Seminar Questions

1. How is autonomy integrated into loitering munitions, swarming, and larger models of drones?
2. What are some of the different functions in drones that integrate autonomous or AI technologies? Why is the integration of autonomous and AI technologies in targeting particularly problematic?
3. How does the integration of autonomous and AI technologies in drones affect human control?
4. What are the key drivers/perceived advantages of developing autonomous drones?
5. What are the problems associated with integrating autonomous technologies into targeting functions of drones?

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Zachary Kallenborn

26 Swarming Drones

Abstract: Drone swarms are drones that collaborate to achieve shared objectives, and they are not science fiction. In May 2021, Israel became the first state to use a drone swarm in combat. Numerous states are pursuing the technology, because drone swarms provide significant advantage in generating overwhelming mass, enabling complex behavior, and native combined arms integration. But they are also vulnerable to information countermeasures, and require a strong sustaining industrial base. If drone swarms prove decisive, then their proliferation could be destabilizing. Especially because drone swarms are new weapons of mass destruction. The chapter provides an overview of military drone swarms, including how they work, why states want them, and the challenges they create for global security.

Keywords: Drone swarms, autonomous weapons, emerging technology, weapons of mass destruction

1 Introduction

Drone swarms are here. In May 2021, Israel used a drone swarm consisting of dozens of drones to strike HAMAS targets (Hambling 2021). The drones dispersed throughout the battlefield, collected intelligence, shared that intelligence with broader Israeli systems, and carried out attacks in conjunction with other munitions (Bohbot 2021). The Israel-based defense company, Elbit Systems, designed and supplied the drone swarm in only a couple years (Eshel 2021).

Israel's use of a drone swarm comes as somewhat of a surprise. Researchers expected drone swarm emergence to take years (Verbruggen 2021). Of course, a single use is not widespread use, and the drone swarm hardly realized the full potential of the technology, such as heterogenous drones working across different domains with different payloads organized with complex coordination and task allocation algorithms (Kallenborn 2018). Nonetheless, drone swarms are here.

What the emergence of drone swarms means for global security is far less clear. Drone swarms can be configured in a variety of manners from small homogenous drones to large, complex swarms operating across multiple domains at once. Drone swarms can also be used in a broad range of missions from anti-submarine warfare to suppression of enemy air defenses or as air defenses themselves. Drone swarms may even be future weapons of mass destruction.

This chapter provides an overview of drone swarm-related issues: what is drone swarm, what military value do they have, how to counter them, and what strategic challenges they raise.

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2 What Is a Drone Swarm?

Media depictions and analyst commentary often describe any use of multiple drones as a "drone swarm" (Hacaoglu 2020). This is not true. A technical drone swarm requires some form of inter-drone communication. That communication allows the drones within the swarm to collaborate and work together as a single unit (Verbruggen 2019). Communication also means greater technological requirements to integrate the drones, and that communication also creates a new vulnerability that may be exploited (Kallenborn 2022). Communication also gives rise to unique emergent behaviors (Ilachinski 2017).

Any use of multiple drones can be described as *drones en-masse*. Although communication can enhance drone capability, it is also unneeded for many missions. The Iranian attacks on the Saudi Arabian oil refineries are a good example. Multiple drones and missiles carried out highly precise strikes against Saudi oil equipment, causing a significant reduction in global oil output (Pamuk 2019). It's not clear communication would be a big add: the refinery equipment is in fixed locations easily identifiable with satellite imagery.

A true drone swarm consists of four basic elements: platforms, payloads, control stations, and the swarm management system. The integrated platforms and payloads allow the drone swarm to create battlefield effects, while the control station and swarm management system enable the drones to work together in service of broader objectives.

Drone platforms can come in a wide range of shapes and sizes. Currently, most drone swarm research focuses on relatively small aerial drones. But a drone swarm might also consist of big surface ships, ground drones, or undersea drones. For example, Russia has demonstrated a drone swarm consisting of a ground drone connected to several aerial drones that relay targeting guidance (Bendett 2021). Or an aerial drone swarm may have different size drones to accomplish different roles: small scout drones provide situational awareness, while large aerial drones carry out strikes. A drone swarm may operate across multiple domains and sizes, such as an anti-submarine warfare swarm that operates under the sea, on the surface of the ocean, and in the sky simultaneously.

Drones in a drone swarm can also carry all manner of payload. Drones may carry bombs, missiles, or anti-tank grenades. They might also carry cameras, infrared sensors, or electronic warfare payloads. They might even carry chemical, biological, or nuclear weapons (Kallenborn and Bleek 2018). Diverse payloads may be integrated together to achieve effects greater than the sum of their parts. Dedicated sensor drones may be equipped with a mixture of cameras and infrared sensors to provide targeting guidance to attack drones armed with bombs and jammers. Or a drone swarm might combine conventional and unconventional weapons to create combined arms effects: drones spray chemical agents to force an adversary into cumbersome hazmat gear,

while other drones follow up with conventional attacks. Of course, the laws of physics still apply. A thimble-sized drone is not carrying a 500-pound nuclear warhead.

Control stations allow humans to provide overarching guidance and assign strategic behaviors and plans to the drone swarm. Current artificial intelligence (AI) is quite good at narrow, defined tasks – a DARPA simulation found an AI-controlled F-16 beat a human controlled F-16 5 to 0 (Hitchens 2020). But larger decisions like whether the F-16 should engage in the dogfight, strike a different target, avoid a fight and carry out a separate air patrol, or retreat is a different matter. That is for humans. The Marine Corps developed a simple drone swarm of over a dozen drones capable of being a controlled by a handheld tablet (Harkins 2018). The Marines provide higher-level commands like mission objectives, while the drone swarm carries out the details. Control systems may also be integrated into other platforms. For example, the Air Force is experimenting with drone swarms that can be controlled from a manned aircraft (Atherton 2017).

The swarm management system consists of algorithms,[1] software, and any specialized hardware for inter-swarm communication that integrate the drones into a single unit. Simple drone swarms do not need much. Follow the general trajectory of the group, and don't collide with anything else. Such simple rules can be powerful when applied at scale. Harvard School of Engineering's kilobot swarm of 1,024 robots self-assemble into various images based on similar, simple rules (Wyss Institute 2014). Similar rules govern biological swarming behaviors, like starlings. Over a thousand starlings can create large, tight flocks that fly in complex ways. Starlings do this by just using cues from their nearest neighbors (Young et al. 2013). A drone swarm for search and rescue may not even need that, just the ability to coordinate a grid search over a defined area.

A critical aspect of swarm management is the swarming algorithms that coordinate task allocation between the drones in the swarms. A drone swarm requires algorithms to decide which drone should take which action in which context. Software code is also needed to translate specific tasks into drone actions, e.g., "search over there for an air defense asset." Signal transmitters and receivers are needed to allow communication between the drones. Signals may be transmitted via acoustic, infrared spectrum, Wi-Fi, or other forms of electromagnetic spectrum transmission. The communications architecture of the drone swarm may vary. For example, communication may be fully decentralized with a collective intelligence providing control. Or specific drones may serve as leaders with commands sent to subordinate drones. Or a drone swarm may have a mixture: a large mothership operating autonomously that provide

1 For those unfamiliar, the Oxford English Dictionary defines "algorithm" as a "a process or set of rules to be followed in calculations or other problem-solving operations, especially by a computer." Basically, this is the programming that tells the drones in the swarm how to work together, and what to do when they identify a potential target. If, say, the drones in the drone swarm are coordinating a search over an area, the algorithm enables the drones to determine how to coordinate that search.

higher-level commands to smaller drones that coordinate the details in a decentralized manner. For example, the mothership may carry the drone swarm to a specified location, then disperse a group of small drones to coordinate a search and return to the mothership after a specified time. Communication may even be inferred through behavioral inference: one drone observes the behaviors of another drone in the swarm and changes its behavior based on a crude interpretation of intent or simple rule (e.g., “never be more than one meter away from other drones in the swarm.”)

Military drone swarms require the swarm management system to handle considerable complexity. The battlefield is complex, dynamic, and uncertain. New enemy forces may show up; anticipated enemies may be gone; and the terrain may not look as expected. The drone swarm must be adaptable to these changes. Drones may need to coordinate searches, groups may split off to attack different targets, and drones may possess different types of payloads. All of that requires more than simple behavioral rules.

Drones in a drone swarm may vary in their degree of autonomy and use of AI. Autonomy basically refers to the ability of machines to act on their own, while AI is the ability of machines to process, make sense of, and make decisions about information. A drone swarm may navigate and move autonomously, without requiring human operators to give specific “go here” or “go there” commands, but humans may maintain control over critical functions like deciding when or where to fire a weapon. Or humans may not, letting the drone make the decision in a true autonomous weapon fashion. Likewise, a drone swarm may incorporate machine vision to identify and classify targets of interest, or the drone swarm may just transmit sensor feeds to soldiers to interpret. The details will vary based on the military’s technological capacity, policies around autonomy, and mission needs. But the key point is: drone swarms are not necessarily killer robots.

3 What Is the Military Value of Drone Swarms?

In a 2020 RAND Corporation war game around a US-China conflict over Taiwan, drone swarms proved decisive (Trevithick 2022). The drones served as decoys for F-35s, confusing and overwhelming Chinese air defenses, exhausted Chinese surface to air missiles, and suppressed defenses. The results fit with the broader ways unmanned systems have been used in combat. Drones can be intelligence platforms, carry out strikes, and collect propaganda. In the Ukrainian and Nagorno-Karabakh conflicts, drones did all of those. In Ukraine, as of September 13, 2022, Ukrainian Bayraktar TB-2s accounted for 70+ Russian losses, while losing only 14 TB-2s (Oryx 2022a; Oryx 2022b). The TB-2 also provided intelligence to support the destruction of the Moskva, Russia’s flagship in the Black Sea (Hambling 2022). In the Nagorno-Karabakh conflict, the TB-2 accounted for the loss of 144 tanks, 35 infantry fighting vehicles, 19

armored personnel carriers, and 310 trucks (plus dozens of artillery pieces and air defense systems) (Roblin 2020). Drone swarms scale all these capabilities, enhancing three main aspects: mass, broad area coverage, and complexity.

Drone swarms represent a return to the importance of mass (Scharre 2014). Massed drone swarms can overwhelm target defenses. In a 2012 Naval Postgraduate School study, modeling of eight-drone attacks on naval destroyers showed four drones would typically breakthrough contemporary defenses (Pham et al. 2012). The findings are unsurprising. Drone detectors and interceptors are not typically well-equipped to handle many drones at once (Holland Michel 2019). The ability to overwhelm can be useful in a wide range of missions where the target is vastly more valuable than the drones: consider a group of $1,000 drones attacking a $77.9 million F-35 or a $13.3 billion aircraft carrier. Even if most drones get shot down, if enough get through, and cause critical damage, then the drone user may gain significant strategic advantage (Hammes 2016). Although *drones en-masse* can provide this mass too, the integration of the drones into a single unit allows drone swarms to operate more dynamically, coordinating strikes across a single large target or numerous small targets. Dynamic coordination allows militaries to use drone swarms more effectively for massing, because difficult command and control tasks can be automated using swarming algorithms. Plus, drone swarms may coordinate attacks across multiple axes at once.

The flipside of mass is the criticality of replenishment and defense industrial capacity, especially in protracted conflicts (Vershinin 2022). A drone swarm might sustain a high attrition rate, and still achieve tactical success, but the lost drones cannot be used for the next mission. If the goals of deploying a drone swarm are narrow and short-term, no big problem. However, if drone swarms are used in a sustained, major conflict, then replenishment will quickly become an issue. In the Ukraine conflict, drone replenishment became a major challenge with both Ukraine and Russia seeking civilian drones, and relying on allied states to support supply (Tucker 2022). But attrition may not be a big challenge depending on where, when, and how the drone swarm is used.

Communication and system integration enables drone swarms to operate over a broad area. Drones may distribute broadly, sharing information about potential strike targets, items of intelligence interest, or just general situational awareness. Sharing may be done either between the drones, or relayed back to human minders to provide a holistic picture about what is happening on the battlefield. With advanced autonomy and AI, drone swarm behaviors become even more complex. If one drone identifies a potential target, the drone may relay the information to the broader swarm and human minders. A group of nearby drones may be tasked to collect additional information or prepare for a swarming attack. As drone swarms become more flexible, so too will be their response options.

Drone swarms may mix and match different platforms and weapons payloads to achieve significant combined arms effects. A drone swarm might, for example, incorporate electronic warfare and anti-personnel payloads. The electronic warfare payloads

may help jam communications or counter enemy drones, while the anti-personnel payloads carry out attacks on enemy infantry. Alternatively, a drone swarm might combine conventional and chemical or biological weapons payloads. The chemical weapons may force an adversary into protective gear that slows their motion and reaction, increasing the effectiveness of follow-on guns and bombs. Combined arms can even take place across multiple domains. Because soldiers may not know what sort of chemical attack they face, benign simulants may create the same effect. Ideally, a drone swarm should be able to add, remove, or change different types of payloads and drones to accommodate mission needs.

The integration of arms in a drone swarm may be more effective than human arms integration. Combined arms can be built into the very source code of the drone swarm. That allows faster, more effective reactions. Battlefield experience as well as insights from modeling and simulations, exercises, and war games, can be built into the drone swarm's algorithms and code. Of course, that does also change how those lessons are learned and integrated. A soldier can learn and adapt on the field, but changes to drone swarm code and design would require dialogue between weapons designers, operators, and battlefield commanders. That means the learning process will be slower, even if it improves over time. Though methods may exist to make learning more adaptable in the field (Insinna 2022). But of course, militaries will find ways to counter all these advantages.

4 How Do You Stop a Swarm?

No technology exists without a counter-measure. Even a science fiction superbomb that reliably destroys every enemy soldier and vehicle in a 10 km radius while harming no civilians or civilian structures must be delivered to the battlefield, and rely on intelligence to know when and where to deploy. Delivery systems can be destroyed, while intelligence can be manipulated or disrupted. Drone swarms are not science fiction superweapons, and are vulnerable to an array of counter-measures from conventional air defense to directed energy weapons. However, an open question is how well those counter-measures work, how well drone swarms can defend against them, and how the offense-defense dynamic plays out over time. In the unlikely event counter-measures render drone swarms irrelevant two decades from now, that makes little difference in a cataclysmic global war that breaks out in a decade. And future technological improvements may counter drone defenses, making drone swarms decisive again.

The basic idea of countering drone swarms is well known. Imagine a thousand drones carrying out an attack on a military base. Shooting down one drone every minute is not a great defense, especially if each shot costs a million dollars. Defeating all the drones would take all day, and the swarm would have overwhelmed the military base.

Ideally, a drone swarm defense should take out a bunch of drones in a single shot, and take out a bunch more soon after. The challenge is doing that.

Information warfare is likely to play a critical role in countering drone swarms too (Kallenborn 2022). The common dominator for every drone swarm is the communication links that bind them together. To be a drone swarm, the drones must have some capacity to share information and coordinate action, even if only in the most trivial way. That means electronic attack to sever those communication links is likely to be effective across a wide range of drone swarms. Although severing intra-swarm communication links might not destroy the drone swarm entirely, jamming might disorient and disrupt the drone swarm, preventing it from getting the real advantages of being a "drone swarm" (Scharre 2015). That makes follow-on attacks far easier. However, the technical details will, of course, vary significantly: an undersea drone swarm may use acoustic signals for intra-swarm communication, while an aerial drone swarm may use electromagnetic waves. Likewise, jamming intra-swarm communications is likely to be much more difficult than jamming operator to drone communications, because the drones in a swarm may be quite close together.

The most promising approach to countering drone swarms seems to be microwave weapons. Microwave weapons like the Tactical High Power Operational Responder (THOR) system emit microwave radiation to fry components of every drone in a large cone (Perkins 2021). Of course, stronger drone defense can counter microwave radiation (Office of Naval Research 2022). Drones might harden critical components against radiation, or drone users might deploy anti-radiation weapons to gravitate to and destroy microwave emitters. Nonetheless, directed energy and broader information warfare techniques are worth exploring.

Extensive research and development has gone into countering aerial drones, but how best to counter multi-domain drone swarms is a truly open question (Holland Michel 2019). No significant open-source research has considered how best to counter ground, surface, or undersea drones. What should a military do if faced with a Russian ground drone with a heavy cannon guided by several aerial drones? Should the defender pray to St. Javelin and destroy the ground drone or is the best approach to blind, disable, or shootdown the aerial drones? (Kallenborn 2023) If the drone swarm makes heavy use of autonomy and AI, can those systems be manipulated?

5 What Strategic Challenges Do Drone Swarms Raise?

Drone swarms, like any other military technology, are tools. Tactical and technical aspects of drone swarms create geopolitical relevance in their ability to influence and interact with national and global security. That is, states and their militaries only deploy drone swarms, because they believe the weapons will help achieve national ob-

jectives, from influencing global politics to protecting the nation. In turn, that creates new global challenges to be addressed: if drone swarms prove decisive in war, then selective proliferation may destabilize regional power balances. Plus, what happens if terrorists acquire drone swarms?

Drone swarms could affect regional stability, depending on how significant uses become. A recent RAND corporation war game found drone swarms connected with fifth-generation wireless technology could prove decisive in a conflict between China and the United States over Taiwan (Trevithick 2022). Drones would overwhelm Chinese sensors, exhaust enemy magazines, and help suppress air defenses (Trevithick 2022). Drone swarms could conceivably prove just as critical in other conflicts, since drone swarms can conceivably be applied to virtually every mission. Especially concerning is anti-submarine warfare.

The emergence of ubiquitous sensors, autonomous platforms, and AI has led to some concerns over ocean transparency (Brixey-Williams 2016). Historically, the value of nuclear submarines has been in their ability to hide in the vastness of the ocean. Even if an enemy state attempts a crippling decapitation nuclear strike, the nuclear submarines will remain hidden and can retaliate. But if roaming bands of undersea drone swarms augmented with intelligence analysis of adversary submarines, doctrine, and patterns of behavior can identify the submarines, that may change the equation. In fact, it's already happened. Recent archival research revealed that during the Cold War, the United States believed they could identify the locations of all deployed Soviet nuclear submarines (Green and Long 2019/2020). The complexity though is that just finding the submarines is not enough. A military still must have assets in range and capable of carrying out the strike (Kallenborn 2019). That could be a challenge if ocean transparency is lagged: data processing and analysis delays understanding by hours, days, or weeks. Nonetheless, the risk to nuclear weapons systems is worth exploring, as are the risks of drone swarms as weapons of mass destruction in their own right.

Drone swarms represent new weapons of mass destruction with risks akin to traditional chemical, biological, and even nuclear weapons (Kallenborn 2020). Drone swarms combine two proprieties common to traditional weapons of mass destruction: mass harm and low reliability.

The scalability of drone swarms mean they can bypass any arbitrary threshold for mass harm. For example, the US Naval Postgraduate School is exploring the possibility of drone swarms of over 100,000 drones, operating across surface, undersea, and air domains (Hambling 2021). Whether states will deploy such massive drone swarms is an open question (just moving 100,000 drones would be a massive logistics challenge), but there appears to be little theoretical reason to believe they could not (Atherton 2019; Kallenborn 2021).

A truly massive drone swarm must necessarily incorporate significant autonomy and AI. Humans cannot control more than four drones at once without significant mission loss, much less a thousand (Cummings and Mitchell 2008). AI and autonomy

enables operators to control vastly more drones at once by automating critical tasks, but that also comes with serious risks. Current AI is often highly brittle. A single pixel change is enough to convince an AI a stealth bomber is a dog (BBC 2017). Inter-swarm communication amplifies risk, because one drone's mistake may cascade to the drone swarm as a whole. Likewise, emergent behaviors add an extra layer of uncertainty in which individual successes may add up to collective errors. If thousands of drones are talking and working together, how will they behave in a complex, dynamic battlefield? (Lachow 2017)

Drone swarms also offer significant asymmetric capability to non-state actors. Terrorists may have a new path to causing mass casualties. Numerous drones can be integrated into a single, powerful weapon with one (or even no) operator providing overarching tactical control. A future terrorist could release a drone swarm over a crowded concert or stadium with the drones coordinating bombing across the massed people. Alternatively, terrorists could use drone swarms to overwhelm harder targets, like a warship or head of state. In the hands of terrorists, drone swarms might be weapons of mass discrimination: employing facial recognition to identify and target parliamentarians who voted in favor of a law the terrorist despises (Kallenborn, Ackerman, and Bleek 2022).

The United States and global governments need to consider how best to combat drone swarm proliferation. If drone swarms are future weapons of mass destruction and weapons of terror, then their proliferation could be quite destabilizing. A nefarious regime might equip a drone swarm with facial recognition to identify and intimidate members of an ethnic minority. After all, Saddam Hussein used the threat of chemical warfare to intimidate Kurdish minorities, and to hold back Iranian aggression (Jervis 2011). But how best to prevent such a regime or a terror group from acquiring drone swarms is an open question. The problem is the capacity for individual drones to become a drone swarm resides largely in the system code, although there may be some physical manifestations like transmitters and receivers for inter-swarm communication. How readily can an export control official determine whether a drone is swarming-capable or just a regular commercial drone that is fine to ship? The communication systems that enable drone swarming may be a clue, but only if inter-drone swarm communication hardware can be clearly separated from communication systems for ordinary command and control.

Counter and nonproliferation may nonetheless benefit from international norms and treaties regarding autonomous weapons generally. Because the weapon of mass destruction aspect of drone swarms stems from the risk of autonomous target engagement, treaties and norms that restrict autonomous weapons in general would necessarily apply to drone swarms. That would allow states to employ smaller, more controllable drone swarms, while restricting the riskier manifestations of the technology. The nature of drone swarm technology may make identifying problematic uses easier. An outside observer can reasonably infer that a nefarious actor deploying a 10,000 drone swarm used against a civilian population is an autonomous weapon, be-

cause no human could plausibly control such a huge swarm. That would enable punishing responses, such as sanctions or retaliatory strikes.

6 Conclusion

Drone swarms are here. Israel integrated dozens of drones to carry out attacks in real world conflict. But that's just the beginning. Future drone swarms will be larger, more sophisticated, and operate across multiple domains at once (Rogers and Kunertova 2022). Future drone swarms may even reach the level of weapons of mass destruction, with thousands of drones integrated in a single, error-prone weapon. As governments around the globe develop drone swarms and counters to them, states will need to think carefully about what uses of drone swarms are riskiest for themselves and global society. Is the real worry undersea swarms that may pose significant risks to submarines? Is it drone swarms used to suppress air defenses? Is it nefarious regimes using drone swarms as weapons of intimidation against their domestic population? Are new global treaties needed to combat proliferation and build norms against particularly egregious uses of drone swarms? Drone swarms are here; now what?

Seminar Questions

1. What applications of drone swarms are most significant for global security?
2. Do the benefits of drone swarms outweigh the risks?
3. Should states attempt to counter the proliferation of drone swarms? If so, how?

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27 Countering Unmanned Aircraft Systems

Abstract: Unmanned aircraft, commonly referred to as drones, have become a part of our daily lives and thus a concern for civil and military security. Currently, the focus is primarily on defending against drones in the low, slow, and small categories, although the entire spectrum of drone types, and thus the options for countering them, is much broader. This article provides a brief overview of the current capabilities of civilian and military drones and a proposal for how to comprehensively protect against them through legislative, governmental, law enforcement, and military measures.

Keywords: Countering unmanned aircraft systems, C-UAS, drone defense, comprehensive approach, drone threat, drone capabilities, force protection, air defense, C-UAS methodology

1 Background

Over the last decades, Unmanned Aircraft Systems (UAS) have been fielded in every military service, ranging from handheld micro-UAS to medium-sized tactical systems to full-grown Remotely Piloted Aircraft (RPA). At the same time, the civilian market has witnessed an exponential growth of predominantly smaller systems intended for public and recreational use. However, the latter use case has gained the attention of law enforcement agencies and military force protection communities due to the increased misuse of Commercial-Off-The-Shelf (COTS) 'drones' in the vicinity of airports, public events, and military installations.

Technology is developing rapidly, in many cases, faster than the defense industry or the military can react. For example, many 'traditional' countermeasures against small UAS rely on electronic jamming of the command and control (C2) link between the 'drone' and its remote control. Many current COTS products are, however, able to navigate autonomously to a given coordinate or can be controlled via a Global System for Mobile Communications (GSM) network from the operator's mobile phone. These features make jamming either completely useless, since the C2 link is no longer required to navigate, or unavailable, because of peacetime restrictions that prohibit the jamming of frequencies that are in use by the public.

Additionally, a sole focus on the Low, Slow, and Small (LSS) end of the Counter-UAS (C-UAS) spectrum covers only a fraction of current UAS technology and excludes most military applications. Adversary forces can be expected to employ UAS at the same level of technology, and under comparable operational principles, as the Western militaries. The following sections briefly describe a spectrum of C-UAS considera-

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tions and why the sole focus on the LSS end is not sufficient to cover all aspects of defense against potential adversary UAS engagements.

2 The Operating Environments

In contrast to most military disciplines, the challenge of defending against UAS is not limited to a wartime scenario. Rather, a considerable part of C-UAS work will already have to be dealt with as a peacetime task.

2.1 Wartime

Not only in a peer-to-peer conflict scenario, but also during lower tiers of escalation between parties to a conflict, adversarial use of unmanned systems against friendly forces has to be anticipated throughout the entire range of UAS classes and capabilities. Especially in the early stages of a developing conflict, UAS may be the preferred choice as they do not involve the risk of human casualties, hence they lower the potential for escalation. On the other hand, this may also lower the threshold of UAS employment, which in turn increases the need for having to counter these systems early on.

In wartime, military forces can utilize the complete range of combat activities to counter UAS, limited only – as every combat action – by International Humanitarian Law (IHL), the Laws of Armed Conflict (LoAC), and the Rules of Engagement (RoE). This does not necessarily mean that countering UAS in wartime would be easier than in peacetime, but the military portfolio of potential actions is significantly broader – to include targeting UAS ground installations and personnel – and the engagement options are less restricted.

2.2 Peacetime

The threat from UAS in peacetime can be almost exclusively narrowed down to consumer and commercial drones whereas at the same time, the threat from larger military systems can be almost neglected, assuming that the regular airspace surveillance is sufficient to deter foreign countries from unauthorized entry into our national airspace.

The main challenge of having to counter UAS in peacetime is not defending the airspace, it is rather the problem of detecting drone threats in the first place, and then securing military installations and critical civilian infrastructure from unauthorized intrusion and potential damage, while at the same time, domestic law typically

restricts military activities to a minimum. Depending on the respective national regulations, military countermeasures may not be applicable at all and the entire responsibility may lie with the law enforcement agencies, which, in turn, requires very close civil-military cooperation and coordination.

Finally, the protection and safety of the civilian population takes priority over all defensive measures, which considerably limits the 'traditional' options for defending against flying objects. There is simply no acceptable collateral damage in peacetime. Hence, new approaches are required, e.g., to maneuver drones to safe locations or to land them in a controlled manner before the final countermeasures can be taken.

3 General Threats from Unmanned Aircraft Systems

UAS are basically flying platforms which can be equipped with a multitude of sensors and weapons. Depending on their size, this may range from a simple camera up to a full set of guided ordnance on a military system.

3.1 Imaging Sensors

The typical sensor on even the smallest consumer drone is a digital camera. However, even non-military UAS, for example commercial drones used by farmers to monitor their crops and fields can incorporate sophisticated sensors, such as LiDAR (light detection and ranging) or multi-spectral electro-optical (EO) cameras. Some of the most relevant imaging sensor types are:

- *Electro-Optical/Infrared sensors* extend from the ultraviolet (UV) through the visible region to the infrared (IR) spectrum. EO/IR systems are depending on the illumination of the target or the target's emission of light. EO/IR sensors are in general sensitive to the environment and depending on the weather conditions, light may be refracted, absorbed, or scattered, reducing the quality of the captured image. However, EO/IR sensors can intensify the light waves received and provide imagery also at night (Koretsky, Nicoll, and Taylor 2013).
- *Synthetic Aperture Radar (SAR) and Inverse Synthetic Aperture Radar (ISAR)* provide high-resolution imagery independent of daylight, cloud coverage, or weather conditions. Through processing, modern SAR systems convert the captured raw data in real-time and provide a perfect vertical view of the target area. In recent years, SAR units have become smaller and more capable as hardware is miniaturized and better integrated, so even smaller systems like Boeing's "ScanEagle" can provide tactical SAR coverage (Moreira et al. 2013).
- *Light Detection and Ranging (LiDAR)* is a remote sensing method that uses light in the form of a pulsed laser to measure ranges to the surface. These light pulses

generate precise, three-dimensional information about the shape of the Earth and its surface characteristics. There are a multitude of civil and military applications for LiDAR such as terrain and vegetation mapping, mapping beneath forest canopy or water surface, creation of digital surface and city models, or forest height and density measurement (NOAA 2020; LiDAR UK 2020).

– *Multi-/Hyper-Spectrum Sensors.* All materials reflect, emit, scatter, and absorb electromagnetic waves in a characteristic way. However, only a small portion of this spectrum is visible to the human eye. Military applications include the detection of disturbed soils, which can be an indicator of a buried Improvised Explosive Device (IED), or revealing the presence of explosive materials. Image processing software can then process the captured image and make the information visible to the human eye (Lagueux et al. 2007; Onat, Carver, and Itzler 2009).

All of the aforementioned sensors are not limited to military systems only. Commercial, and to a limited extent also consumer systems, may incorporate these sensor capabilities. Conclusively, we have to anticipate that basically every UAS may be capable of capturing thermal signatures, mapping terrain and objects through clouds and beneath forest canopies as well as detect disturbed soil from, for example, tracked vehicle movements.

The broad accessibility to these sensor capabilities can be considered a game-changer as they transform even commercially available consumer drones into a viable threat to military operations.

3.2 Weapons

Military UAS such as the Chinese “Wing Loong” series, the Russian “Altius” and “Okhotnik,” or the Iranian “Shahed-129” are allegedly capable of carrying air-to-ground, and in some cases also air-to-air ordnance (Frew 2018). For example, the Russian “Altius” is expected to support up to two tons of combat payload (Soper 2018), whereas Iran is said to have dropped multiple Sadid-345 guided bombs on the Islamic State in Syria with their “Shahed 129” UAS (Taghvaee 2017). However, little is known about these systems’ actual capabilities, and we should anticipate a level of targeting and precision strike abilities which is comparable to own systems.

Consumer and commercial drones are generally unarmed, but can be modified to carry serious amounts of explosives, converting them into an airborne IED. They may also be turned into more nefarious weapons by attaching hazardous material such as a nuclear, biological, or chemical payload. Unfortunately, criminal and terrorist ingenuity is almost unlimited and difficult to predict. So even small consumer drones require serious attention as they can have considerable destructive potential if they have been modified accordingly.

3.3 Target Acquisition and Indirect Fires

Over the last two decades, Western militaries, especially the United States, have proven the effectiveness of UAS and how significantly these systems contributed to linking sensors and shooters. UAS became an integral part in the sequence of Find, Fix, Track, Target, Engage, and Assess (F2T2EA), also often referred to as the "Kill Chain." This has not gone unnoticed and other countries are now incorporating similar Tactics, Techniques, and Procedures (TTP) into their own doctrine.

For example, Russian forces have acquired the capability to use numerous layered sensors to feed into their target acquisition cycle, to include multiple UAS platforms – even COTS products – which relay target data to artillery systems for action. This has been demonstrated in Eastern Ukraine where Russian forces direct and adjust fires with their unmanned systems. Ukrainian forces have repeatedly seen a systematic approach by the Russians to acquire a target, determine its coordinates, and adjust their artillery fire with UAS in a total timeframe of about 10–15 minutes (AWG 2016; McDermott 2018a).

The Russian example shows that mimicking proven Western tactics is not a question of expensive military technology. It can be done quite successfully with only consumer and commercial products.

3.4 Electronic Warfare

Since 2008, the unifying themes of Russian Armed Forces reforms have been asymmetry and the recognition that the means and methods of modern warfare have changed. From Russia's point of view, its adversaries would seek dominance in the aerospace and information domains, which exponentially enhances the role of Russian Electronic Warfare (EW) to level out NATO's information superiority (McDermott 2018b).

The Russian "Orlan-10," for example, can be equipped with an EW suite as part of the Leer-3 EW system, enabling it to disrupt GSM signals within a radius of 6 kilometers. In addition, the UAS can imitate a cellular base station, forcing connections from nearby devices, analyzing their transmissions and locating their position (IHS Jane's 2019a).

The Chinese "Wing Loong II" appears to come in a Signal Intelligence (SIGINT) variant as well. Pictures of a circular antenna array fitted underneath the fuselage indicate that the system could be capable of intercepting communication signals while providing a bearing of the transmitting signal (IHS Jane's 2019b).

4 Unique Threats from Unmanned Aircraft Systems

4.1 Swarming

Unmanned systems are typically cheaper than manned aircraft, especially if consumer and commercial products are taken into account. This price advantage creates the opportunity to acquire multiple times more UAS than manned combat aircraft. Grouping together multiple UAS creates a so-called ‘swarm’ and depending on their numbers they are expected to cause significant challenges for current Air Defense systems. For example, in January 2018, an improvised swarm of ten drones rigged with explosives was employed in a coordinated assault against Russia’s Hmeimim airbase in western Syria. The drones appeared to have been assembled from a small engine, cheap plywood and a number of small mortar shells and were allegedly launched from a site more than 50 kilometers away. Although all of the drones were eliminated or forced to land, this incident has proven that the concept of swarming is a viable threat, even when using improvised devices (Balkan 2019; Reid 2018).

4.2 Autonomy

True autonomy in terms of having a robot or machine making an informed decision by itself has not yet been achieved. However, the technology to create fully automated systems that use pre-programmed algorithms to process the robot’s sensor inputs is readily available (Haider and Catarrasi 2016).

One example of an autonomous UAS is the Israeli Aerospace Industries’ (IAI) “Harpy,” an anti-radiation loitering munition that can autonomously home in on radio emissions. The “Harpy” is designed to loiter over the battlefield for about six hours and attack targets by self-destructing into them or returning home, if no target could be engaged during the duration of the mission. China purchased an undisclosed number of “Harpy” drones in 1994 and unveiled a reverse-engineered version of the system, the ASN-301, during a military parade in 2017, which appears to be a near copy of the original (Kania 2018).

Moreover, even today’s consumer products incorporate highly automated functions, such as active detecting, tracking and following of persons and objects, or waypoint navigation with autonomous trajectory calculation and active obstacle avoidance based on the drone’s sensor inputs (DJI n.d.).

Both categories, commercially available drones as well as military UAS, should be considered ‘autonomous’ in the way that they probably no longer require a permanent command and control link to fulfill their mission. This eliminates many of the current countermeasures which rely on jamming their radio transmissions.

4.3 Lower Operational Threshold

Unmanned systems offer three principal advantages over manned systems concerning the operational threshold when projecting military force.

- *Reduced Risk.* Minimizing the risk of losing a human pilot has been the driving factor for developing UAS. Because there is no human on board, there is no casualty if the UA is shot down or captured by enemy forces.
- *Expendability.* Compared to manned aircraft, UAS come at significantly lower cost. Some tactical UAS, but especially smaller systems, are specifically designed for expendability and some of them are not even considered for reuse.
- *Less Potential for Escalation.* Employing UAS to penetrate foreign airspace and to gather intelligence bears less risk of escalating an emerging crisis as no humans get killed if a UAS is shot down.

These three factors contribute to the fact that the operational threshold for deploying these systems is likely to be lower than using manned aircraft. Therefore, we should anticipate the employment of military-grade UAS already during a developing crisis.

5 The Spectrum of Countering Unmanned Aircraft Systems

To understand the full spectrum of countering UAS, it is important to note that exclusively focusing on the Unmanned Aircraft (UA) or 'drone' does not provide the complete picture. UAS are grouped into several categories and consist of numerous components, depending on their size and application.

5.1 Unmanned Aircraft System Components

The basic setup of a small UAS consists of an operator, a remote control, a C2 link and the aircraft or 'drone' itself. Larger systems may also incorporate a dedicated Ground Control Station (GCS) for Launch and Recovery as well as a Mission Control Element (MCE) for conducting the operation. The larger systems typically utilize space-enabled BLOS (beyond line of sight) communications for the C2 and data links. GCSs and MCEs consist of physical infrastructure such as trucks and containers or buildings, which typically host the computer hardware and software that, in turn, run the applications required to operate the overall system.

As a general rule, the larger the UAS, the larger the requirement for infrastructure such as shelters, runways, airfields, or airports. The same is true for the amount of logistics support, such as fuel, ammunition, and maintenance.

Finally, unmanned systems always require personnel to operate them. This can vary from a single individual operating a small ‘drone’ up to multiple aircrews rotating in shifts in case of larger systems. Higher class military UAS performing collection missions also require a significant amount of Processing, Exploitation and Dissemination (PED) personnel to analyze the information provided by the UAS.

5.2 Unmanned Aircraft System Categories

NATO categorizes UAS into three dedicated classes, ranging from Class I for the micro, mini, and small ones, to Class II for medium-sized, tactical systems, to Class III for Medium-Altitude Long-Endurance (MALE) and High-Altitude Long-Endurance (HALE) aircraft (NATO 2019). By comparing the three different classes, their application, size, and operating altitude alone, it can be concluded that countering this spectrum of UAS requires a multitude of different, class-specific approaches.

5.3 Unmanned Aircraft System Design Principles

Apart from their different classifications as described above, UAS also follow various design principles, according to their application and purpose. Depending on the specific UAS design features, detection and potential countermeasures may be challenged, denied, or even not applicable.

5.3.1 Unmanned Aircraft

UA can be fixed-wing, rotary-wing, and some even incorporate stealth designs. Smaller systems (Class I) typically follow the rotary-wing principle whereas larger systems (Class III) almost exclusively utilize a fixed-wing design. Tactical systems (Class II) follow both principles. Stealth designs are predominantly found with large HALE aircraft but sometimes also with tactical systems.

5.3.2 Propulsion

Throughout all classes, the majority of UA are propelled by a rotorcraft engine which allows for greater fuel efficiency and therefore longer endurance. However, some UA are equipped with jet engines, trading-in mission duration for faster speeds and larger payloads. Upcoming generations of UA are envisioned to incorporate hypersonic propulsion and may achieve airspeeds faster than Mach 5.

5.3.3 Communications

C2 of a UA is generally conducted via a LOS (line of sight) or BLOS radio link. Depending on the unmanned system's level of autonomy, this radio link is active either permanently or only on demand. UAS radio links encompass the range from common wireless networks up to dedicated satellite communications frequencies in the Ku-Band. The upcoming 5G standard will utilize even higher frequencies and mobile phone applications for command and control of UAS via GSM are already available on the commercial market.

5.3.4 Data Transmission

It can be anticipated that every radio link and every other form of digital communications between unmanned system components will be secured to a certain degree. Even commercially available 'drones' use either proprietary data link protocols or encryption to secure their communications.

6 A Comprehensive Approach to Countering Unmanned Aircraft Systems

Figure 27.1 provides an overview of UAS components and their relative spatial arrangements. Depending on the component itself, the domain it is operating in and its potential distance to friendly forces, there are different points of attack presented as options for the employment of countermeasures. While these points of attack can be addressed by the missions described in the sections below, all should complement each other and contribute to a comprehensive, multi-domain C-UAS effort.

6.1 Force Protection

LSS UAS are readily available as COTS products to anyone and pose an imminent threat to critical public infrastructure and military installations. Force protection measures assuring the safety of friendly forces and critical infrastructure are typically focused on the area which requires protection. Natural and human-made obstacles such as trees or buildings can cover an approach of LSS UAS and significantly delay the detection of these objects in the area, further shortening available reaction time. Force protection measures should primarily be aimed at denying access of UAS to the protected area. However, it may also be desirable to safely capture the UAS for intelligence purposes.

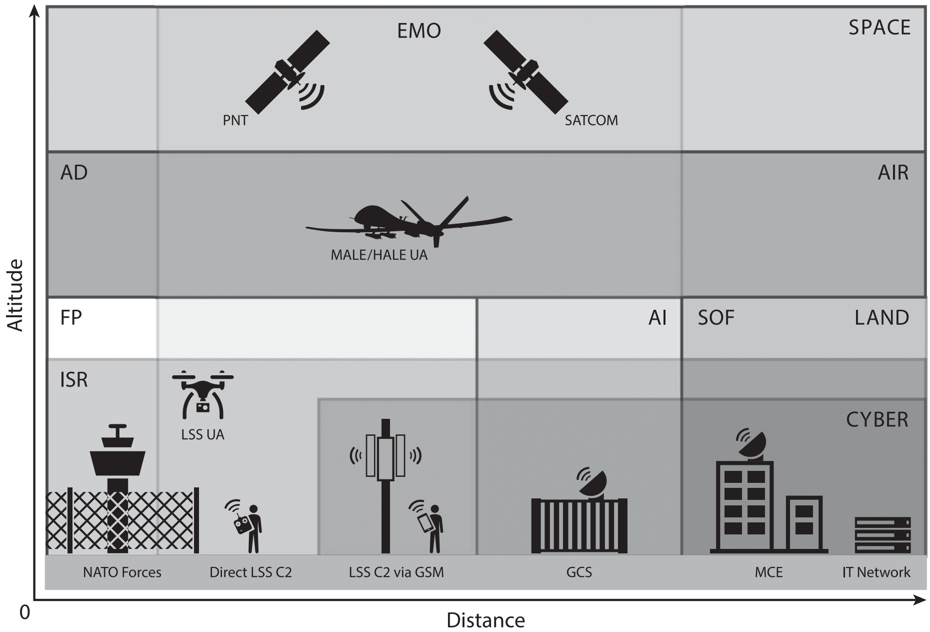

Figure 27.1: Spatial arrangement of unmanned aircraft system components (Haider 2021a) ©JAPCC.

6.2 Air Defense

Larger UAS can operate at altitudes of up to 30,000 ft., and in some cases even higher. The Radar Cross Section (RCS) of these UAS is comparable to any other legacy aircraft, hence they can be detected and engaged by most Air and Missile Defense (AMD) systems. However, modern surface-to-air ammunition is not cheap and is designed to engage high-value targets. Large numbers or a swarm of low-cost UAS may quickly turn the cost-benefit ratio of traditional AMD upside down and render current systems inefficient. Short-Range Air Defense (SHORAD), Counter-Rocket, Artillery, and Mortar (C-RAM) systems, and even legacy Anti-Aircraft Artillery may provide an effective, but also efficient, defense against UAS.

6.3 Close Air Support and Air Interdiction

Launch and Recovery of larger UAS is typically conducted from GCS inside or near the mission area. GCS can be mobile and mounted on a truck, or stationary when placed on the ground, e.g., near an airfield. In any case, the Launch and Recovery Element (LRE) of larger UAS is a high-value target as it is often responsible for launching and recovering several UA. Eliminating an LRE will likely bring UAS operations to a

halt in the respective area as new UAS cannot be launched anymore and airborne ones may not be recovered safely. Thus, Air Interdiction may disrupt, degrade, deny, or destroy an adversary's unmanned capabilities before they can be even used against friendly forces.

6.4 Special Operations

Once airborne, larger systems can often be handed over from the LRE to an MCE and operated BLOS via Satellite Communications (SATCOM). The MCE can be located far outside the mission area, probably deep inside the adversary's territory and utilizing a hardened infrastructure. NATO Special Operations Forces (SOF) may be employed as a means to attack the enemy's MCE itself, take out the SATCOM ground nodes which are essential for UAS BLOS operations, or even kill adversary combatants such as UAS crew members during their time off duty.

6.5 Cyber Warfare

UAS are entirely dependent on their computer systems, information technology, and network connectivity. Control stations, especially inside fixed installations such as an MCE, are potentially vulnerable to an attack through cyberspace, exploiting security vulnerabilities of their hardware and software but also by taking advantage of human failure, negligence, or susceptibility. COTS UAS being operated via a GSM network are most likely only accessible through the cyberspace domain, since countermeasures in the electromagnetic spectrum may be off-limits, e.g., if frequencies are publicly used.

6.6 Electromagnetic Operations

C2 of UAS is conducted via LOS or BLOS radio transmissions and typically also reliant on Position, Navigation, and Timing (PNT) signals. Electromagnetic Operations (EMO) can be used throughout all tiers of UAS to hinder and disrupt C2 and PNT transmissions or even to spoof PNT information to divert or land the UAS. However, 'traditional' EW has its limits with modern models of UAS which are capable of autonomous flight and are no longer reliant on continuous data links. However, upcoming Directed Energy Weapons (DEW) such as High-Power Microwaves (HPM) or High Energy Lasers (HEL) may add kinetic capabilities to the EMO portfolio and could be used to render sensor payloads inoperable or destroy the UA itself (Raytheon Missiles & Defense 2020).

6.7 Intelligence, Surveillance, Reconnaissance

Detecting UA in flight is often the first step in defending against them. Larger UA can be detected even with legacy radar systems, whereas LSS UA require more specialized equipment to distinguish them from clutter, e.g., leaves and birds. However, apart from airspace surveillance, reliable identification of the intruding UAS and its capabilities, as well as identifying the origin of the C2 transmission, is critical for selecting the appropriate countermeasures. This includes information about the capabilities and the level of autonomy of the UA, locations of adversary LREs and MCEs, as well as SATCOM assets and frequencies used. C-UAS systems have to be fed this information, preferably in real-time, to process a suitable targeting solution.

6.8 The Space Domain

SATCOM is an essential part of BLOS UAS operations. But COTS UAS also utilize PNT signals provided by respective satellite constellations. Within the limits of the "Outer Space Treaty," countermeasures against space-based communications and PNT may be a legitimate option to defend against an entire fleet of adversary UAS. This does not necessarily require kinetic engagements by anti-satellite weapons. Indeed, ground or space-based jamming capabilities could be effective without risking the creation of large amounts of debris which could render entire orbits unusable for mankind.

7 Legal Considerations for the Enforcement of Countermeasures

Applications for UAS range from public and recreational purposes to military missions including airstrikes. Consequently, depending on their use, defending against these systems is governed by either domestic or international law, and the legal framework that needs to be applied is also dependent on whether it is peacetime or wartime.

7.1 Peacetime Versus Wartime

Defending against UAS is not only a wartime requirement. Frequent incidents (Dedrone n.d.; FAA 2022) have already proven that COTS 'drones' can easily be flown into restricted airspace and are able to stop an entire airport's flight operations. It is only a question of time before the first incident will be witnessed over military installations, e.g., air bases, headquarters, or military training grounds.

Depending on the country and its domestic laws, which are applicable during peacetime, circumstances may prohibit certain types of countermeasures and limit the options for defending against UAS. These possibly prohibited countermeasures include: kinetic engagement of airborne UA, jamming of publicly used frequencies such as GSM or wireless networks, or interference with the commercial PNT signals.

In general, it can be assumed that countering UAS in peacetime will be subject to a multitude of civilian restrictions which may or may not fully apply in a conflict scenario. C-UAS doctrine and TTP need to include these particulars and adhere to individual legal environments.

7.2 Law Enforcement Versus Military Engagement

In peacetime, the responsibility for the defense against 'drones' and UAS typically lies with civil law enforcement agencies. However, responsibilities may overlap near military installations and critical infrastructure. Moreover, law enforcement agencies may require military support since the equipment to detect, identify, and engage UAS might reside only in the armed forces.

Hence, close cooperation and coordination between civilian law enforcement agencies and the armed forces are essential for a comprehensive C-UAS approach. Mutual exercises could help establish common C-UAS TTPs and ensure an effective level of interoperability between civil and military organizations.

7.3 Public Safety and Collateral Damage

The protection of civilians from harm is the primary principle of both international as well as domestic law. Therefore, defense against UAS requires consideration of the potential risks to human life, both in peacetime and in wartime. Civilians may be endangered by kinetic measures such as the shooting down of UA or an attack on its ground facilities.

Additionally, non-kinetic measures such as jamming radio frequencies or PNT signals may affect public and commercial communications infrastructure and therefore, may be restricted or completely off-limits. Especially in peacetime, countermeasures have to be balanced against potential adverse impacts on critical communication systems and possible economic losses.

Depending on the payload, e.g., biological toxins, chemical gases, or explosives, it may be required to maneuver the UA out of range of friendly forces or civilians before the actual countermeasure can be employed. Therefore, 'traditional' C-UAS methods which take effect on the spot need to be reviewed and new approaches such as capturing aerial vehicles and neutralizing payloads should be considered.

7.4 Legislation in Support of Countermeasures

Dedicated legislation may assist in defending against UAS in such a way that COTS ‘drones’ are required to transmit an identification and positioning signal comparable to the regular civilian air and maritime traffic. Some manufacturers already equip their drones voluntarily with transponders that provide this information on a separate and unencrypted radio frequency. Of course, this will not prevent criminal or terroristic abuse of these systems, but if legislation were in place, any system not providing a transponder signal could be classified as potentially hostile.

8 A Methodology for Countering Unmanned Aircraft Systems

The challenge of Countering Unmanned Aircraft Systems (C-UAS) has been recognized and taken seriously after incidents with commercially available drones showed that even small systems could project a viable threat to political leaders, critical infrastructure, and commercial businesses.

A multitude of C-UAS systems have since been developed to satisfy the growing need to defend against drones, especially in the low, slow, and small spectrum. In principle, these systems are designed to detect and then engage the threat, and some systems have indeed proven to be quite successful in fulfilling their mission.

However, a comprehensive C-UAS approach must not only rely on reacting to an imminent threat, but it has to include preventive measures as well. Assuming that preventive measures helped eliminate the presence of a drone in the first place, then no active countermeasure would be necessary.

This section offers a potential methodology which incorporates preventive as well as reactive countermeasures. The countermeasures are listed sequentially, based on the time available to employ them. Figure 27.2 portrays that approach in general terms, whereas the subsequent sections will describe every measure in more detail.

8.1 Preventive Countermeasures

Preventive countermeasures have the advantage, if successfully applied, that a potential threat will not even occur and reactive countermeasures need not be employed. Moreover, they are not subject to time pressure, as preventive measures can be taken well in advance and thoroughly planned.

8.1.1 Deterrence

Successfully deterring enemy forces or civilians from using UAS or drones will negate the threat completely. In order for deterrence to be effective, enemy forces or civilian drone users have to anticipate such negative consequences that the mere prospect of suffering them is sufficient to refrain from using UAS or drones.

Deterring enemy forces from using UAS is undoubtedly problematic, as these systems offer significant military advantages without putting the lives of their forces at risk. However, the prospect of losing a high number of UAS to NATO air defenses may be a sufficient deterrent if the adversary's military budget is constrained or the availability of UAS is so limited that losing them is not affordable. Strategic Communications (STRATCOM) may also help spread the message that UAS employment against NATO territory or forces will be denied or come at a high cost. Consumers and commercial companies may be fined for unlawful use of their drones. This probably requires dedicated legislation, but at minimum the incorporation of unmanned flight into the national rules of the air. This may not entirely prevent drone incidents, but it may help reduce them significantly and allow the focus on actual threats.

8.1.2 Suppression

If enemy forces or civilians cannot be deterred from using UAS or drones, the next step would be to deny them access to NATO airspace or protected areas and prevent them from achieving their goals.

For military UAS, NATO air defenses and EW are likely the most effective means that can successfully suppress enemy UAS operations. During open conflict, Air Interdiction and cyber-attacks against UAS ground installations and networks may prevent UAS employment right from the start. EW will also work against consumer and commercial drones; however, peacetime restrictions may limit this option significantly. Again, legislation may be an option to impose obligations for manufacturers that drones adhere to flight restrictions automatically, e.g., incorporating geo-fencing parameters by default.

8.1.3 Avoidance

If the employment of UAS or drones cannot be deterred or suppressed, the detection or effects from these systems need to be avoided.

Avoiding detection or kinetic effects from the air is not new. However, many traditional measures may not have been sufficiently trained or even forgotten in the last decade due to the war on terrorism and the actual absence of a serious air threat. Long established TTP may have to be brought back to soldier's minds, and, if neces-

sary, reviewed and modified for this new type of air threat. Modern sensor technology may be countered by fielding newer materials which are capable of better absorbing or reducing radar reflections or thermal signatures. Protective measures for military installations and critical infrastructure, but also military forces in the open, may require review and modernization to shield them from detection and kinetic effects.

8.2 Reactive Countermeasures

8.2.1 Detection

As a prerequisite for any further countermeasures, the existence of a threat must first be identified. Detection is the first action in a series of active measures against UAS or drones, and therefore time is one of the most critical factors. In general, detection must take place at the earliest possible time and the furthest measurable distance.

Intelligence, Surveillance and Reconnaissance (ISR) is the key to detecting and identifying threats from UAS or drones. Most importantly, ISR should not be limited to the UA itself; the detection of any elements or components of an unmanned system could help to increase situational awareness of an imminent adversarial deployment of UAS. Electromagnetic Operations as part of SIGINT could also contribute to detecting UAS and drone threats as most systems require continuous radio transmissions to operate. Newer methods of command and control (C2) of UAS and drones use cellular networks, and this may require additional cyber tools to help detect this communication. In particular, the use of drones for private and commercial use may require updated regulations and data protocol disclosure to help law enforcement agencies and the military detect and identify drone operations.

8.2.2 Decision Making

Defending against an imminent UAS or drone threat is the most time-critical. Due to their size and altitude, the detection of LSS drones can be expected to be generally later and the reaction time significantly shorter than for HALE and MALE UAS or fighter aircraft in general.

Established Air C2 and Time-Sensitive Targeting (TST) procedures may require a review to determine if and how to accelerate decision making processes and probably delegate decision making authorities to counter this new type of air threat. Countering LSS drones is probably more a question of rapid self-defense at the team or squad level than decision making at higher echelons. This may require the general incorporation of drone countermeasures into the regular curriculum and training of each soldier. Additionally, countering UAS and drones in peacetime may require close cooperation with law enforcement agencies and the clear delineation of responsibilities.

8.2.3 Neutralization

Defending against UAS or drones not only involves traditional kinetic engagement of the air threat, but may also require actions against other UAS elements and components to be effective. Non-kinetic measures and activities in the electromagnetic and cyber domain may contribute to a more balanced and proportionate C-UAS approach, if peacetime restrictions apply or fratricide and collateral damage is a concern.

With lesser priority, but certainly worth considering, are the cost-benefit assessments when having to counter cheap UAS and drones. Cheap production and acquisition of drones is an enemy's clear asymmetric advantage, if NATO's options are limited to costly countermeasures only. Legacy AD systems, which are no longer suitable for fighting 5th generation aircraft, could offer excellent potential for a cost-effective C-UAS solution.

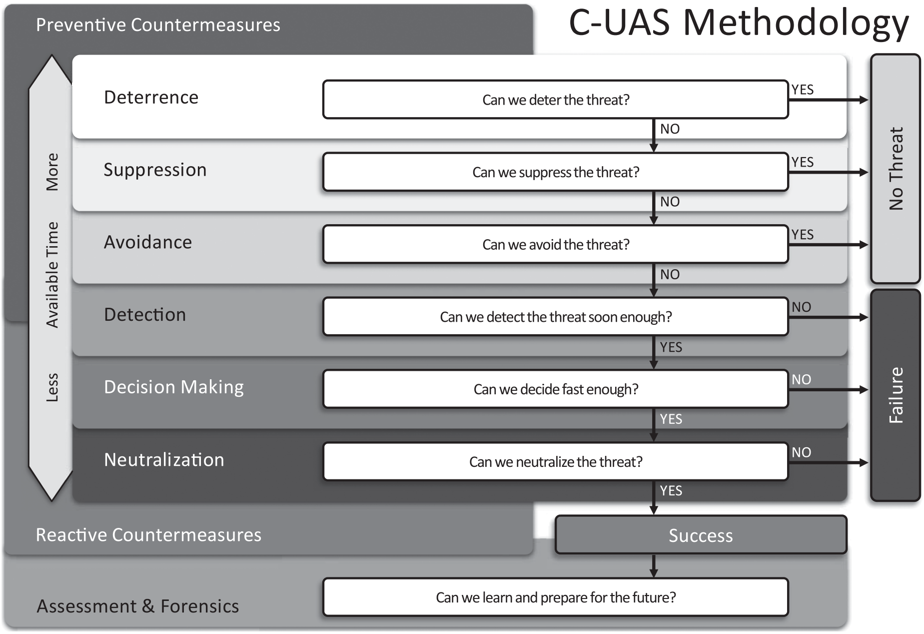

Figure 27.2: A methodology for countering unmanned aircraft systems (Haider 2021b) ©JAPCC.

9 Summary

This chapter was intended to provide an overview of the complexity of having to counter UAS. Different classes, applications, and design principles of the Unmanned Aircraft itself challenge or even deny certain types of countermeasures. Moreover,

larger unmanned systems may include ground installations, data links, computer networks as well as logistics, support equipment, and dozens of personnel. Hence, there is no 'one-size-fits-all' solution to the C-UAS challenge.

Time is the key factor when having to counter UAS or drones. Most of the currently available C-UAS systems focus on the "detect, track, and engage" sequence only. Passive measures and preliminary actions to deny adversarial UAS and drone usage right from the start help reduce potential threats, focus on less remaining targets and gain precious time. Once active measures have to be taken, decision speed is decisive. Moreover, C-UAS is not an anti-air activity only but includes actions against all elements of the unmanned system. Non-kinetic and low-collateral damage approaches complete the picture and contribute to a balanced and proportionate C-UAS approach.

Finally, countering UAS requires a comprehensive approach by all the military and also non-military disciplines who can project lethal and non-lethal effects on any of the components of an unmanned system. Additionally, all these potential countermeasures require review under the different legal frameworks applicable in wartime, but more importantly in peacetime. Typically, in peacetime, military and civil authorities usually own different powers which require close coordination when employing countermeasures.

Seminar Questions

1. What are the challenges of countering different types of drones on the battlefield?
2. What is a 'comprehensive approach' to countering UAS?
3. What emerging technological advancements are making it harder to counter drones?
4. What are the differences of countering drones in peacetime and wartime?

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Visions

Michael P. Kreuzer

28 The Diffusion of Drone Warfare – A Ten Year Review

Abstract: In 2013, the author of this chapter began his doctoral dissertation work examining the evolution and diffusion of military drones, and published his dissertation findings in 2014. Following ten years of drone warfare in Iraq, Afghanistan, Azerbaijan, Yemen, Ukraine, and elsewhere, he examines the central findings of that 2014 study and how well adoption-capacity theory has predicted the spread of drone warfare. The key findings – limited spread of revolutionary strategic drones and widespread use of tactical drones as key force multipliers as an evolution of the modern system – have largely shown to be correct over the interceding period. Specific projections about the spread of counter-drone technology, and the emergence of major drone exporters besides early exporters like the U.S., China, and Israel have however varied significantly from initial projections have shown challenges remain in projecting the diffusion of emerging air warfare technologies.

Keywords: Diffusion, adoption-capacity theory, strategic drones, tactical drones, revolution in military affairs, modern system, Iraq, Ukraine

The past two decades have seen a dramatic increase in the public's awareness of drone operations, and extensive debate over the ethics of 'killing by remote control' and the precedent it could set for future technology-driven conflicts. In particular, the US drone campaign against terrorist entities in Pakistan, Iraq, Afghanistan, and Yemen has raised the specter of a new era of air warfare, where countries could bypass advanced fighters and bombers in favor of cheap and easy to produce drones. This first wave of drone literature often saw Predator drones as interchangeable with F-22 fighters, and projected global diffusion of similar capabilities.

Against this backdrop, and given personal experiences with the 'drone wars,' I set out in early 2013 to evaluate the prospects of drone diffusion, and in particular the organizational complexity and unique mission sets suited for the drone technology at the time. Rather than a singular capability, I postulated drones, like 'aircraft,' represented a larger umbrella term for multiple aircraft and capabilities, and each capability required distinct organizations and doctrines to successfully operate. By unpacking those capabilities, it was clear the US strategic drone innovation represented an expensive and organizationally intense capability that few states would have the strategic requirement to fully develop. Smaller, tactical drones would much more widely diffuse but with differing implications for warfare depending on the specific state-level requirements. Ten years later, as drone warfare has proliferated, many of these projections have come to pass, with the wide diffusion of the smallest drones for surveillance and propaganda and the slow diffusion of larger US strategic remotely piloted aircraft (RPA). Recent con-

https://doi.org/10.1515/9783110742039-028

flicts in Ukraine and Nagorno-Karabakh pose the strongest tests to future drone diffusion and effectiveness challenges, and though many questions remain to be answered several key lessons can already be gleamed from the first two decades of drone wars.

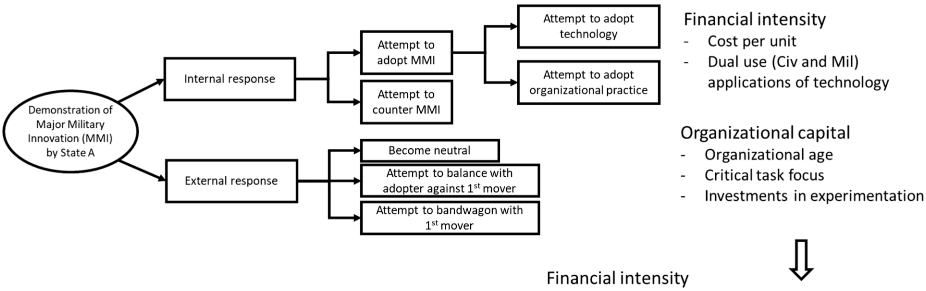
1 The Diffusion of Drones – 2013 Outlook

2013 marked a relative lull in the drone wars as pursued by the US since 2007, as operations in Iraq, Afghanistan, and Pakistan declined. This marked an optimum time for reassessment of the first wave of drone literature, particularly the claims that the US drone model was revolutionary and set a dangerous precedent for virtually all conflicts moving forward. As one early critic put it, "The skies of our world are filling with round-the-clock assassins. They will only evolve and proliferate [. . .] we are already in the process of creating a Terminator planet [that] should give us pause for thought [. . .] or not" (Turse and Engelhardt 2012, 18–19). Drawing on both personal and academic experiences, I was skeptical. The drone missions flown by the US gave it a specific tactical and operational advantage, but the technology in the aircraft represented only the visible pointy end of a very long, complex, and manpower intensive spear – a major innovation within a larger and ongoing evolution in air warfare rather that a revolution unto itself. If this instinct was true, that drones represented a major military innovation but that they did not fundamentally change the underlying facts and systems of air warfare, then the implications for proliferation and international order was significantly different than pessimists believed.

To analyze diffusion, I turned somewhat ironically to one of the theories that initially gave me pause due to its potential conclusions as applied to drones. Michael Horowitz's landmark book *The Diffusion of Military Power* (2010) outlined a strong model for diffusion of major military innovations through what he termed adoption-capacity theory. Adoption-capacity theory, as shown in Figure 28.1, projects the rate of diffusion of a military innovation by evaluating its costs to implement versus its organizational capacity to adopt the change. Costs to implement are a factor of the dual-use civilian-military applications of the innovation, and the per-unit cost of the asset. Organizational capacity, meanwhile, is a function of the organization's age, willingness to experiment, and critical task focus.

Although Horowitz did not evaluate drone warfare directly, his conclusions at the time[1] placed drone warfare in the same context as many first-generation scholars of drone warfare – that they would be a potentially cheap alternative to future air forces and a very disruptive innovation that could "fundamentally change air power equation" (Horowitz et al. 2020, 222). In particular, this analysis noted the comparison of

1 More recent scholarship by Horowitz and others has similarly sub-divided the drone innovation into multiple innovations, allowing for greater analysis of diffusion trends. See Horowitz et al. (2020).



Financial intensity

Organizational capital		Low	High
	Low	Rate/extent fast - Chemical weapons	Rate/extent moderate - Nuclear weapons
	High	Rate/extent moderate - Suicide terrorism	Rate/extent slow - Aircraft carriers

Figure 28.1: Adoption-capacity theory schematic (derived from Horowitz 2010, 27, 40, 49).

the F-22 Raptor to the RQ-1 Predator (a common comparison at the time), stating "high-end estimates for the MQ-1 Predator drone place the production costs at about $6 million per plane (a system including four planes costs around $30 million), compared to over $200 million dollars per F-22" (Horowitz et al. 2020, 222). This comparison, combined with discussion in subsequent paragraphs of off-the shelf commercial drone technology and cheap drones being employed by other states imply drones fall into the low-financial-intensity/low-organizational-capital quadrant with rapid diffusion being the result.

Against this baseline, I modeled drones not as a single category as was the wider trend in literature in the early 2010s, but instead as a series of distinct innovations with the drone as a platform inside larger systems. Further, for this exercise I limited my scope largely to 'air warfare' missions, meaning intelligence collection or armed attack missions in direct support of military operations and not engaged in other potential support roles such as resupply and rescue. In this model, shown in Table 28.1, the US system of drone warfare represented an expensive and organizationally/doctrinally complex innovation, placing it in the category of slow diffusion. Basic commercial-off-the-shelf drones, modified for tactical military uses such as battlefield intelligence collection or dropping simple and unguided bombs, represented a low cost and simple organizational/doctrine innovation model, placing it in the rapid diffusion category.

These two categories were relatively straightforward, but more complicated was trying to project other uses for armed drones in other circumstances between these extremes. The template offered by adoption-capacity theory provided a strong framework for hypothesis generation, leading to several predictions. First, some states that had money but lacked both the operational history and strategic requirement for the US-style deployed drone mission would seek drone capabilities that, at least on the surface,

Table 28.1: Drone adoption-capacity projections, 2013 (see Kreuzer 2016, 157).

		Level of financial intensity required to implement major military innovation	
		Low	**High**
Level of organizational capital required to implement major military innovation	**Low**	**Rapid diffusion** – Tactical RPAs – Global	**Moderate diffusion** – Prestige RPA platforms used in tactical roles – China, Russia
	High	**Moderate diffusion** – RPAs acquired through partnership – Japan, India, European states	**Slow diffusion** – Strategic RPAs/UCAVs – US, UK, Germany, Israel, future China

appeared to mirror the US capability and provided those states with a 'prestige' drone weapon. China and Russia fit that mold for drone developers and suppliers, but at that time I did not project which states would likely be consumers of their drone proliferation. Second, states with a clear need for drones who had a history of organizational adaption but lacked the baseline strategic infrastructure or deployable requirement would instead invest in drone platforms of similar capability to the US, but tailored to more conventional and tactical missions. The drones themselves would be acquired through military partnerships, while the focus would be homeland defense or near-border security. The Israeli model for tactical drones, which developed following the Yom Kippur War and was paralleled by the US Army in the AirLand era, seemed the model for this type of activity, as was the US Army's counterterrorism drone experience with route clearance and tactical surveillance using smaller drones.

2 The Diffusion of Drones – 2023

Today, the diffusion of drones is no longer the hypothetical it was in 2013. When analysts today speak of drone wars, they are as likely to speak of the conflict in Ukraine as they are of US counterterrorism operations. Indeed, Ukrainian drone operations, along with the performance of drones in the prior Nagorno-Karabakh conflict, were heralded in early 2022 as a "game changer" (Mgdesyan 2020) or a "magic bullet" (Hambling 2020) that has "changed the nature of warfare" (Witt 2022), echoing similar claims about US drone strikes a decade prior. But as with US strikes the experiences of conflict and the reality that these weapons have significant limitations in operations, both due to challenges of targeting accuracy and to the adapting nature of adversaries in conflict, have led more recently to a reassessment. By July 2022, four months after the conflict in Ukraine began, observers in popular media began to note

that improved Russian tactics were taking a toll on the Ukrainian drone war, rendering this once lauded game changer as “increasingly ineffective” (Shoaib 2022).

The rise and fall of hype surrounding drones in these conflicts, combined with the technological and proliferation developments of the last decade, have shed significant light on the nature of technological diffusion more broadly, and served as a solid initial test of the 2013 model and projections. States with an active drone inventory have risen by 58% over the past decade, with at least 95 currently believed to have an active inventory (Center for the Study of the Drone 2020, 2019 dataset). Of these 95 states, only one third, or 31 states, operates what Bard College’s Center for the Study of the Drone classify as Class III drones – medium altitude, long endurance (MALE) or high altitude, long endurance (HALE) drones with a typical endurance of near 24 hours or more, a payload capacity of several hundred kilograms, and a top speed of approximately 300 kilometers-per-hour or more (Center for the Study of the Drone 2020, 2020 update, p. IV). This roughly equates to the US military’s definition of Group 3 or larger unmanned aircraft, incorporating both large tactical drones and the most advanced combat systems (Joint Chiefs of Staff 2021, III-31). The most significant of these drones and the states which have adopted them are depicted in Table 28.2.

Comparing these current capabilities to the 2013 projections, a few modifications of the projected diffusion trends are apparent. Table 28.3 illustrates the updates to Table 28.1, with changes italicized. While China in the future may work towards adopting the full US drone capability, current indications are its focus is both on platforms and exports, which for now leave it out of the high financial intensity, high organizational capital category. US NATO allies, meanwhile, have seen a rise in political viability in supporting drone operations for peacekeeping and stability operations among other missions, elevating many more US-allied states into that same category. The apparent failure of many states to adopt counter-drone technology at the rate I had initially expected has allowed many more states to acquire more capable, but often range-limited, armed drones for tactical to operational level military missions.

3 Case 1 – US Counterterrorism Operations

The US use of drones in the War on Terrorism is likely the first thing the average observer envisions when the phrase ‘drone warfare’ is mentioned. The US shift towards drone warfare beginning in late 2007 as a vital tool in its counterterrorism arsenal led to the first significant wave of academic and popular literature looking at the implications of drones for the future of war, leading to such varied titles as Nick Turse and Tom Englehart’s critical *Terminator Planet* (2012) and P.W. Singer’s *Wired for War* (2009). Though drones have played a role in air warfare dating to the years before World War II, their sudden emergence as the new and often critical weapon in a new

Table 28.2: Class III drone diffusion as of March 2020 (derived from multiple sources: CNAS drone database, Bard).

Airframe	Class	Producer	States Operating Airframe	Armament
MQ-1 Predator	MALE/ Armed	US	US, Italy	AGM-114 Hellfire
MQ-9 Reaper	MALE/ Armed	US	US, UK, Australia, France, Italy, Netherlands, Spain	AGM-114 Hellfire, 500-lb guided munition
MQ-1C Gray Eagle	MALE/ Armed	US	US	AGM-114 Hellfire
CH-4	MALE/ Armed	China	China, Algeria, Ethiopia, Indonesia, Iraq, Jordan, Myanmar, Saudi Arabia, United Arab Emirates, Zambia	AR-1/2 missile, 300-lb air-to-surface munitions
Wing Loong 1	MALE/ Armed	China	China, Egypt, Kazakhstan, Pakistan, United Arab Emirates	Up to 440-lb air-to-surface munitions
Wing Loong 2	MALE/ Armed	China	China, United Arab Emirates	Up to 1,050-lb air-to-surface munitions
Bayraktar TB-2	MALE/ Armed	Turkey	Turkey, Azerbaijan, Djibouti, Ethiopia, Kyrgyzstan, Libya, Morocco, Niger, Pakistan, Qatar, Turkmenistan, Ukraine	4 × 50-lb micro-munitions
RQ-4 Global Hawk	HALE	US	US, Japan, South Korea	
MQ-4C Triton	HALE	US	US, Australia	
RQ-170 Sentinel	HALE	US	US	
Hermes 900	MALE	Israel	Azerbaijan, Brazil, Chile, Colombia, Switzerland	
Heron 1	MALE	Israel	Israel, Australia, Brazil, Canada, Ecuador, France, Germany, India, Singapore, Turkey	
Eitan/ Heron TP	MALE	Israel	Israel, Azerbaijan, Germany	
RQ-5 Hunter	MALE	Israel	Israel, US, Belgium, France	
Anka	MALE	Turkey	Turkey, Tunisia	

Table 28.3: Drone adoption-capacity projections, 2023.

		Level of financial intensity required to implement major military innovation	
		Low	**High**
Level of organizational capital required to implement major military innovation	**Low**	**Rapid diffusion – Case 4** – Tactical RPAs – Global	**Moderate diffusion – Case 2** – Prestige RPA platforms used in tactical roles – China, Russia, *Iraq*
	High	**Moderate diffusion – Case 3** – *Drones for interdiction and close air support* – *Israel, Turkey, Ukraine*	**Slow diffusion – Case 1** – Strategic RPAs/UCAVs – US, *NATO, Pacific allies*

overall system of air warfare thrust the 'drone debate' to the center of US policy discourse.

Although the public's awareness of drones suddenly grew in the late-2000s, the US move to drones was a steady evolution two decades in the making, driven largely by the unique strategic circumstances the US faced in the 'unipolar moment.' Following the attacks on US Embassies in 1998, the Clinton Administration launched cruise missiles in retaliatory strikes against al Qa'eda targets in Afghanistan. Their failure to successfully hit bin Laden led to an increased intelligence collection effort to find and monitor his whereabouts. Per several unconfirmed accounts, bin Laden was found in Afghanistan in October of 2000 with a Predator, but the lack of arms aboard the aircraft and the lag time of potentially hours to put a missile from outside of Afghanistan on target prevented a strike. This experience led to orders to find a way to arm Predator, and quickly. Within 38 days, Predator's sensor camera was replaced with a separate sensor consisting of both a camera and a laser designator, facilitating the relay of targeting information direct to F-16 and A-10 platforms. Sensing that making the sensor platform the shooter as well would dramatically reduce the 'kill chain' and increase the effectiveness of strike operations, Air Combat Command pressed for arming Predator in February 2000. The Air Force initiated the program in mid-2000, with the first successful operational test of a Hellfire launched from a Predator on February 16, 2001.

Advanced US drones, operating as part of a global communications network, can extend the reach and the spectrum of operations available based on the added capabilities of the system. Airpower has historically been limited in small wars by the transient nature of aircraft and the limitations of rapid targeting. These are two key factors for which MALE drones that are tied to an advanced global intelligence infrastructure and armed with precision munitions are almost uniquely suited to overcome. Traditional US counterinsurgency wars required an extensive forward presence and regional expertise. Today, only a basic force is required to forward deploy to maintain the aircraft in the theater of

operations and to execute takeoff and landing, while the bulk of the operational element resides within the continental United States. Extensive external support in the form of human and signals intelligence collection is still required to find and fix targets, but as the 2022 strike on Ayman al-Zawahiri in Afghanistan demonstrates the US military is still capable of striking key leadership targets with advanced drones even after major military operations have ceased (Baker et al. 2022).

The convenience of precision strike and a weapons system capable of shortening the kill chain in such a dramatic fashion comes with a number of organizational costs. From a manpower perspective, 'unmanned' US Predator/Reaper operations require four aircraft and 61 personnel forward deployed, and 149 personnel operating from the continental United States. These 210 personnel include 14 pilots, 14 sensor operators, 56 intelligence analysts, and an unspecified number of legal analysts to maintain four sorties for 24 hours. This requirement for nominally 'unmanned' aircraft stems from a historic dilemma in intelligence that most 'intelligence failures' stem not from a failure to collect, but a failure to analyze information collected.

The US model for drone warfare requires multi-source intelligence inputs to effectively analyze adversary systems, from command and control to economic and logistics, assess the critical nodes to strike, find and fix on those nodes, strike, and evaluate the results of those strikes. This global communications and intelligence infrastructure, commonly referred to as 'reachback,' impacts the conduct of the war in numerous ways beyond the costs of technology and manpower involved. A weapons system with this long a manpower and infrastructure tail also results in a heavy bureaucratic process for target selection, analysis, and weapons release. The pilot is not alone in making decisions, and in many cases a minor role in the targeting process. Executing missions require very high levels of training, capabilities, and trust in a large team capable of exercising a readily changing mission without explicit standing orders from senior commanders. This operations mentality, commonly referred to as 'mission command,' enables even junior intelligence analysts to play a major role in reshaping collections and operations in near real time. But, it requires a military culture that is "extremely complex and poses painful political and social tradeoffs" (Biddle 2004, 3) in general limiting its operational applications thus far to western democracies with highly professionalized militaries.

US drone operations require a significant investment in infrastructure and organizational change to enable operations. Calculating cost advantages of these drones versus fixed wing aircraft is often complicated by faulty comparisons as the Predator was built for a unique mission, not to replace a particular airframe. It is slow at 135 mph and carries no defenses, making it a target in most environments without air superiority. The cost-per-flight-hour is low, just over one-tenth the cost of an F-16, but at an estimated $3,253 per flight hour the cost to run a 24-hr combat patrol of MQ-9 Reapers would still be exorbitant for most states. Given the long endurance nature of US operations, the short term costs of maintenance and other expenses is deceptively diluted. As one report from Time Magazine notes:

> If the calculation is for total maintenance costs over the course of a year for a Reaper unit, the relationship changes: at a per year cost of $5.1 million, per individual Reaper, and at $20.4 million per CAP, the Reaper shows itself to be well above the cost to maintain and operate over a year for an individual A-10C (at $5.5 million) or an F-16C (at $4.8 million). Annual operating unit cost for a Reaper unit is about four times the annual cost to operate an F-16 or an A-10.

This cost comparison is deceptive as it looks at the airframe operational costs alone, and not the sunk costs of global operations. The backbone of the US reachback program is the US Air Force Distributed Common Ground System, a global command, control, and intelligence system consisting of satellite connections, intelligence ground stations, and connections to flying ground stations both in the theater of operations and in the United States. The Air Force estimates the per-unit cost of each operating location, including facilities, equipment, communications fees, and personnel support costs, is $750 million. This, combined with the cost of the training pipeline of approximately 1,500 personnel per location, the per-unit airframe cost to operate, and the cost of precision munitions (varying from $25,000 for a GPS-guided bomb, to over $100,000 for a Hellfire missile) makes implementation of the US drone system cost prohibitive for most states.

4 The Iraqi Air Force

"Our strategy can be summed up this way: As the Iraqis stand up, we will stand down." These were the words of President Bush to returning soldiers from Iraq at Fort Bragg in 2005 (Kreuzer 2021, 344). Over the following years, these words became the basic mantra for US strategy in that country – identify the jobs the US and coalition forces are performing, train and equip the Iraqis to do that mission, and pass it to them. Two years later, Iraq began procuring its own intelligence collection aircraft, manned imagery-capable platforms such as the Cessna 208 and the King Air 350. With this investment, the coalition hoped the Iraqis would be able to begin collecting airborne intelligence and enabling a gradual decline in US operations as demands elsewhere in the world rose.

In 2008 the Iraqi Air Force purchased three collection-only C-208s and three AC-208s, which were capable of firing Hellfire missiles. This in practice made the latter aircraft a manned, lower loiter time Predator-equivalent systems. The fledgling intelligence fleet was further supplemented in 2016 by two more AC-208s in a purchase the US State Department declared contributed "to the foreign policy and national security of the United States by helping to improve the security of a strategic partner" (Defense Security Cooperation Agency 2016). Like many of the first-generation scholars of drone warfare theorized, the US policy establishment believed the simplicity and reliability of these aircraft enabled states to have a cheap air-to-ground alternative to a

modern attack fighter like the F-16, and with it a partner for the US capable of its own internal defense from the air.

In late 2017, Iraq's ISR program expanded to include its first significant drone platform, with an initial purchase of six Insitu Scan Eagle aircraft for just under $8 million. Though the Scan Eagle is significantly smaller and less capable than the larger systems employed by the coalition, it and other Group 2 Unmanned Aerial Vehicle (UAV) represent the largest growth in Unmanned Aerial Systems (UAS) proliferation around the world owing to their per-unit reduced cost, lack of need for significant airfield infrastructure to support (requiring instead a catapult launcher and 'skyhook' arresting system), and seemingly more intuitive tactical operational perspective given its shorter range and FMV-dominant collection suite. The United States had flown Scan Eagle in Iraq since 2005, and thus on the surface it appeared a logical platform to spearhead the Iraqi ISR force.

Iraq, like many other Gulf States, has also sought to purchase advanced UAS technology from the US and coalition allies to give it, on paper at least, a similar capability to the US attack capability through systems like the armed variant of the MQ-1 as well as the MQ-9. Strict export controls, such as the Missile Control and Technology Regime, dramatically limited the willingness of the US to consider transferring armed UAS technology to states that were not already members of such technology control regimes. In May 2019, this policy changed to allow US corporations much greater flexibility to sell UAS technology, but as of 2020 the US has not sold its most advanced UASs to Iraq. Instead, Iraq began in 2014 investing in the Chinese equivalent of the early MQ-1, the CH-4. To date, the government of Iraq has acquired ten of these systems, but as of August 2019, only one was assessed to be operational, and scarcely flew operational missions.

In the case of both the Scan Eagle and CH-4, attempts by coalition forces to integrate these systems into the Iraqi military have been largely unproductive. As of the end of 2019, of ten CH-4s operated by the Iraqi government, only one was considered mission capable. Of ten Scan Eagles owned by the Iraqis, an Inspector General report showed that only two sorties were flown in the spring of 2019 due to a "combination of Iraqi training in the United States, a lapse in maintenance contracts, and problems with signal interference" (Operation Inherent Resolve Lead Inspector General 2019)

5 The Ukraine Conflict

The late 2010s saw a significant increase in drone activity in conflicts removed from the US war on terror, ranging from the western Libya campaign of the Libyan civil war (2019–2020), the Nagorno-Karabakh conflict (2020), and most prominently the early phases of the Russia-Ukraine war (2022). Each of these cases has seen the progressive development of tactical drones, from small hand held and individually oper-

ated models for tactical surveillance, to the larger Turkish Bayraktar TB-2. In all cases, the brutal realities of war and the immediate tactical to operational needs of the Ukrainian and Russian forces are driving an innovation-counter innovation drone workshop suited to the varying needs of military forces.

As RAND's Ted Harshberger noted in examining Israeli drones in 2012, "it is very difficult to build long-endurance, highly automated, multi-role unmanned systems of the sort often purchased by the United States and its allies [. . .] it is extremely easy to produce modest-endurance, partially automated, single-purpose unmanned systems" (Harshberger 2012). The Ukraine war is another reminder of this reality in action, with Ukrainian forces in the early phases of conflict effectively using the TB-2 in deep fight operations for both surveillance and attack against Russian land and naval forces. The TB-2 is significantly shorter range and less capable both from an intelligence and a total ordinance payload perspective than US drones like Predator and Reaper, but the capability they provide is almost tailor made for the needs of the Ukrainian military and many other states that have not adopted the strategic bomber strategy of the US Air Force. By maintaining close coordination with ground forces and used almost exclusively for interdicting military targets (troop formations, armored columns, navy ships), the Ukrainian military has leveraged years of US and allied training to build a coordinated air-land maneuver warfare strategy capable of thwarting or significantly slowing the numerically superior Russian invasion force.

Less anticipated than the Ukrainian military's ability to adopt drone warfare modeled on the Nagorno-Karabakh conflict was the early inability of Russian forces to counter the Ukrainian threat. In the years leading up to the 2022 Ukraine conflict, Russian media and outside military analysts hyped the counter-drone technology Russia had developed in reaction to combat in Syria and observations of other conflicts. A report in May 2021 cited Russia as investing heavily in the technology and leveraging 'echeloned defense' against drone threats large and small (Bendett 2021). This purported capability was however absent through the early phases of the conflict, allowing Ukrainian drones to survey Russian positions with impunity and aid the Ukrainian forces in thwarting the early Russian advances. By June, however, Russian forces were able to introduce a significant influx of counter-drone capabilities to largely negate the TB-2 threat, suggesting the challenge may have been operational integration of the capability rather than technical development (Shoaib 2022). At the same time, Russia's pursuit of new Iranian drones has led the US to support Ukraine with its own anti-drone capability, once more demonstrating the importance of the modern system and hider-finder elements of operational and tactical drone warfare as systems proliferate (Thomas 2022).

As the threat of larger drones has seemingly diminished since June 2022 as the counter-drone capabilities on both sides has risen, the risk of smaller tactical drones for directing artillery attacks and dropping small ordinance or 'kamikaze strikes' on adversary forces has risen. At this time there is not significant data available today on the effectiveness of these programs, though the propaganda value for both sides has been high and has also fed the growing narrative of drones changing the character of

modern warfare (BBC 2022). And, although sufficient data does not yet exist to gauge the tactical effectiveness of these drone campaigns, the types of drones and tactics involve are reminiscent of similar campaigns by insurgent entities in the recent past, most notably Islamic State.

6 Islamic State

At the insurgent end of the spectrum, the proliferation of commercial off-the-shelf drone technology has provided adversaries a potential new threat, both for kinetic operations and in the information realm. Beginning in 2016, western media became aware of the emerging threat from small commercial off-the-shelf drones to US forces and allies. In early October 2016, a group of Kurdish forces in Northern Iraq shot down what appeared to be a small UAV like many others that had been spotted in recent months surveying their positions. When they went to investigate the UAS and exploit the aircraft, however, the plane blew up and killed two Kurdish forces. In the battle for Mosul, over 300 drone missions were flown in the span of one month, with as many as 100 of them being armed strike operations. In early 2018, the US Air Force noted that it had not been since the Korean War 65 years prior that US forces had faced threats from enemy aircraft (Grier 2011), but that today the proliferation of commercial quadcopters rendered forces vulnerable to munitions such as grenades dropped from $650 drones.

ISIS and other non-state actors throughout Iraq and Syria have been at the forefront of exploiting small drones in the disorganized battlespace that has followed the collapse of their territorial holdings. Initially, they were used as surveillance platforms to collect intelligence on new Iraqi military posts in Northern Iraq as Iraqi forces slowly moved toward Mosul. One surveillance video, placed online through the "cyber Caliphate," was then followed by Katyusha rocket attacks on the outpost resulting in one US Marine being killed; one of only 17 US military members killed due to an adversary attack through mid-February 2020. At the time, the precision accuracy of this missile was speculated to be attributable to the use of UAS for targeting purposes, a claim emphatically rejected by then-OIR commander Lieutenant General McFarland.

Though the fear remains that UAS proliferation could result in an emerging capability for insurgents to build their own air force complete with a full ISR and attack capability, in practice the threat has been more limited than initially advertised. Though American forces regularly reported seeing UASs in the vicinity of American bases, no similar precision attacks aided by UASs have been noted to date. Islamic State regularly posts propaganda videos showing the capability to employ armed drones to include mock attacks on vehicle convoys (Archambault and Veilleux-Lepage 2020), but outside of engagements against other non-state forces, propaganda appears to be the extent of this capability for the immediate future. In part this may be due to

US forces expanding the use of anti-drone technology and investing more heavily in anti-drone technology, and in part this may be a function of the nature of the conflict. When the US employed a heavy ground force and relied on regular ground movements to attack Islamic State, they were vulnerable to small UASs while today operating from fixed locations in a supporting role the Katyusha rocket remains the weapon of choice.

In this sense, the tactical UAS is more akin to an improvised explosive device (IED) operating in the vertical dimension of war. It is a clear threat at the tactical level with the ability to cause strategic damage to advancing forces, but it is largely reliant on those forces advancing and in situations where they might lose visibility of the threat. But as with radio-controlled IEDs, investment in high-tech counter-solutions can offset this threat for many state actors willing to invest in the technology, training, and other elements necessary to execute an electronic warfare strategy. When the US and allies executed a similar strategy to defeat a proliferation of radio-controlled IEDs in Iraq back in 2007, the response by insurgents was to regress to lower-tech command wire and victim-operated IEDs once more. Like rockets and mortars, a better investment at least given the strategy and the timing.

As with the Russian response to the Ukraine drone threat, the US and its allies were slow to react to the UAS threat, and likely paid a short-term cost in the 2016–2019 timeframe as a result. Despite warnings of the perils of the democratization of drone technology dating to the beginning of the decade, it was not until the threat emerged on the battlefield that the United States invested heavily in counter-UAS technology and reaped significant battlespace successes.

7 Summary

The experience of two decades of drone proliferation and employment in multiple conflicts largely validate the early 2010s models of diffusion of military technology, provided drones are modeled as a variety of different innovations much as military aircraft more generally. States will pursue drones to fill both strategic and tactical requirements, and for their value as a status symbol, with relatively predictable diffusion patterns and employment capabilities when the investment capacity and organizational capacity of the states can be correctly interpreted. Drone warfare is a reality of modern conflict, and both drone and counter-drone proliferation must be a key planning consideration in modern grand strategy.

Moving forward, both UAS and counter-UAS will need to rapidly evolve as the technologies continue to evolve on both sides. Adversaries may continue to adopt small UASs to improve communication security, raising their costs and potentially exposing their supply lines in much the way advanced IED networks came to be traced during the 2007 Iraq War surge, but also making them once more a more viable threat

in the battlespace evading both detection and visibility by opposing forces. Larger, medium-range UASs have also been observed in the battlefields of Syria, extending the range for operations and the payloads as well. In the future, these aircraft could be used once more for reconnaissance and propaganda against coalition bases, flying at sufficient altitudes to image fixed targets, while overflying shorter-range counter-UAS systems. But, with increased size and altitude comes tradeoffs again – reduced target accuracy (think high altitude unguided bombs), the need for airfields and training grounds for mission rehearsals, and crossing the threshold to where they are vulnerable to conventional radar detection. As with the early days of manned aviation, the future of unmanned aviation is dynamic and actors must remain vigilant of advancements to stay ahead of the threat and effectively defeat a rapidly changing adversary force in the sky.

Seminar Questions

1. How has the proliferation of drones changed the character of war over the last ten years?
2. How do military organizations and cultures impact the ability of a state to adopt different models of drone warfare?
3. Given a traditionalist perspective of warfare, how does the proliferation of drone technology represent continuity and gradual evolution in the character of war?
4. Given a futurist perspective of warfare, how does the proliferation of drone technology represent a critical component of an emerging Revolution in Military Affairs?
5. Where does your perspective on drone warfare fall between your answers to question 3 and 4?

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Agnès Callamard and Carolyn Horn

29 Drones: A Unique Danger to International Law

Abstract: The proliferation of inexpensive drones is challenging the international legal regime that has been in place since the end of World War II. What started as targeted drone attacks by a handful of Western powers against alleged terrorists, with dubious adherence to international law, has now been adapted to use by State and non-State actors alike in multiple regions. The prohibition against the use of force, contained in the United Nations Charter, is routinely ignored, the right to life of those living under the continuous threat of drone attack is repeatedly violated, and increasingly the power to launch significant military attacks is in the hands of individuals. The next generation of drones is likely swarming autonomous armed drones, potentially making weapons of mass destruction generally available. A primary justification for drones – their alleged precision – is a myth, and the more recent version of this claim for autonomous drones, that they will be potentially more compliant with international humanitarian law, is likely equally untrue. But this focus is too narrow. The increasing use of drones is a destabilizing force, undermining the international legal order. Autonomous armed drones will magnify and accelerate this trend. Multiple measures are required to prevent this dystopian future, including a legally binding international instrument that would include, among other provisions, a ban on the development, production, use of and trade in autonomous weapon systems that by their nature cannot be used without meaningful human control over the use of force.

Keywords: Arbitrary killings, autonomous weapon systems, civilian casualties, drones, precision, right to life, targeted killings

1 Introduction

The war in Ukraine has confirmed the transformation caused by drones. As Ukraine Vice Prime Minister Mykhailo Fedorov said in November 2022, "In the last two weeks, we have been convinced once again the wars of the future will be about maximum drones and minimal humans" (Bowden 2022). Both sides have relied heavily on surveillance drones and have launched coordinated drone attacks, with Russia targeting civilian infrastructure, a war crime.

Note: The views expressed in this chapter are the personal views of the authors and do not necessarily represent the views of Amnesty International, their employer.

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The global proliferation of inexpensive drones is challenging the international legal regime that has been in place since the end of World War II. What started as targeted drone attacks by a handful of Western powers against alleged terrorists, with dubious adherence to international legal norms, has now been adapted to use by State and non-State actors alike in multiple regions. The prohibition against the use of force, contained in the United Nations Charter, is now routinely ignored, the right to life of those living under the continuous threat of drone attack is repeatedly violated, and increasingly the power to launch significant military attacks is in the hands of individuals.

The next generation of drones, currently being developed by militaries, is likely swarming autonomous armed drones. Less advanced versions are already on the battlefield. These drones, if allowed, will transform war from human against human to machine against machine, with humans being targeted and killed based on algorithms without real-time human oversight. Ultimately, even individual "lone wolves" could have the capability to launch weapons of mass destruction (Russell 2021).

There is a feeling of inevitability to these trends, but this must be resisted. The proliferation of drones, whether autonomous or not, is a destabilizing force, and their primary justification – their alleged precision – is a myth, allowed to continue mainly because witnesses are not on the ground to document the atrocities: the strikes are conveniently "over the horizon." Already, new versions of the "precision" argument are emerging, with claims that autonomous weapons will be potentially more compliant with international humanitarian law. Yet this new alleged precision will likely be as deceptive as the old. The history of drones, as set forth briefly below, demonstrates 20 years of increasing unlawful violence by both States and non-State actors and an increasing lack of accountability – compelling evidence that drones, perhaps uniquely, undermine adherence to international law.

To date, effective regulation of drones has been stalled by actions of a few States, especially those most invested in the development of these weapons. Yet avenues are opening for global action. The UN General Assembly's Liechtenstein resolution mandates debates on issues where there has been a UN Security Council veto (A/RES/76/262), and there is movement to bring negotiations on autonomous weapons outside the context of the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons (CCW), where the rules of consensus have stymied progress. The States who have been subject to, or at risk of, drone attacks are demanding a voice. The Western world, which until now has been generally exempt from attack, should listen.

2 Twenty Years of Progressive Degradation of International Law

2.1 The Initial Blow to International Law

The first drone age began in the years following the 9/11 attacks, when the United States and its allies launched, over time, hundreds of drone attacks both in and outside of conflict zones. To justify these actions, they created a novel interpretation of "self-defense" under Section 51 of the United Nations Charter – and thereby started the decline in international norms.

Specifically, the United States and its allies redefined the doctrine of "imminence" required for self-defense under Article 51 of the UN Charter so that it was no longer a temporal requirement: according to this view, a State did not require "specific evidence of where an attack will take place or of the precise nature of the attack" as long as actions might need to be taken now to prevent a possible future attack (Bethlehem 2012, 776). Moreover, once a State "resorted to force in self-defense against a particular actor in response to an actual or imminent armed attack by the group" (with imminence defined broadly), no further findings of "imminence" were required (The White House 2016, 11). The State was at war, and this war was global. In effect, these States obliterated the distinction between *jus ad bellum* and *jus in bello*.

As this new doctrine evolved, the United States and its allies claimed the ability to launch drone strikes in any country, whether or not on a traditional battlefield and whether or not that country was in allegiance with the target. According to this view, a "State is authorized to use force against particular non-State groups with whom the State has declared itself at war, anywhere, including on the territory of States hosting them, if the latter are unable or unwilling to deal with their threats" (Callamard 2020, para. 55). With the killing of Iranian General Soleimani, the Trump administration extended this doctrine to permit targeting an official of a State with which it was not at war, in yet another sovereign country with which it was also not at war, even though it could point to no specific temporally-imminent attack it was preventing.

Although masquerading as a principle of law, this was a raw assertion of power, used only against those States not powerful enough to object. There has been little ability to debate the issue and States do not appear to have generally adopted these purported changes in international law (Haque 2021; Olabuenaga 2020; Chachko and Deeks 2016). Indeed, Mexico has expressed an understandable concern that the United States could further extend its drone policy beyond terrorism and endanger Mexican territory. It points to the United States, during the Trump administration, contemplating labeling drug cartels as terrorists (Olabuenaga 2019). Recent reporting indicates that Trump in fact advocated launching missiles at drug sites in Mexico (Haberman 2022).

2.2 Rationalizing Increased Killing with the Myth of Precision

These targeted killings have been justified based on their alleged precision – and it is certainly true that strikes can be precise. In the summer of 2022, Al-Qaeda leader Ayman al-Zawahiri was targeted on a balcony by a drone armed with blades, so no one else in the building was harmed. But the history of the past decades demonstrates that this precision is largely a myth, at least if it means fewer civilian deaths overall. Because drone attacks occur largely out-of-sight of the global community, and because they are generally unsupervised by legislative or judicial authorities, drone attacks multiply or decline at the whim of the executive, and those launching them often fail to take the precautions required under international humanitarian law to ensure that combatants are targeted and that any civilian casualties are proportionate to the military objective. Thus the promise of precision has not played out in practice.

Investigations by civil society organizations indicate that drones have increased civilian deaths and injuries. As highlighted in Dr. Callamard's 2020 report and confirmed in a later *New York Times* report, governments routinely undercount civilian deaths, both from misidentifying targets as combatants and from collateral deaths and injuries (Callamard 2020; Khan 2021). In one analysis, manned airstrikes reported a civilian death rate of one civilian per 21 bombs, while drone strikes had a rate of one civilian death per 1.6 strikes (Zenko and Wolf 2016). As an example, earlier attempts to kill Al-Qaeda leader Ayman al-Zawahiri resulted by 2014 in the deaths of at least 76 children and 29 adults (Gibson 2014).

Higher civilian casualties are caused in part by the use of "signature" strikes, where targets are selected by their allegedly suspicious behavior. The ill-fated strike launched by the United States as it exited Afghanistan in 2021 is an example. The United States launched a "defensive strike" against an alleged ISIS bomber and claimed victory immediately after. Only after a *New York Times* investigation forced further evaluation did the United States concede that it had killed an innocent man and nine members of his family, including two toddlers. The behavior it interpreted as that of an ISIS bomber consisted of him "transporting colleagues to and from work" and a colleague "loading canisters of water into his truck to bring home to his family" (New York Times 2021). Importantly, this strike would have been counted by the United States as a successful strike against combatants, but its publicity forced an investigation that would not normally have occurred.

Finally, ignored by this focus on death and injury counts are the long-lasting effects on the communities terrorized by armed drones literally buzzing overhead. This includes financial impacts not only to the families of those injured or killed but to the community generally; psychological trauma, leading to health effects including miscarriages; and environmental impacts (Women's International League for Peace & Freedom 2017; Conflict and Environment Observatory 2017). It also includes collateral effects, such as potential limitations on using beneficial drones for commercial and

humanitarian uses, either because the community fears them or because jamming and other defensive measures make beneficial uses impossible.

2.3 An Increased Focus on Killing Rather than Preserving Life

The availability of drones has changed the mindset of governments and militaries by making targeted killings the go-to option, undermining the protections afforded by Article 6 of the International Covenant on Civil and Political Rights (ICCPR). It is far easier to kill (and claim a "justified" kill) than to preserve life. With armed drones available, no longer is a State required to work with other States to build a system for bringing potential terrorists and criminals to justice or to gather evidence of the person's guilt. Instead, a State can simply kill those they deem a risk, with no due process, no oversight, and no right to remedy. As President Obama stated as he expanded drone targeted killings, "Turns out I'm really good at killing people" (HuffPost 2013).

According to the systemic integration approach in assessing the interplay of international humanitarian and human rights laws (Callamard 2020), human rights law must be considered in conjunction with humanitarian law, even during armed conflict, taking into account the relevant context. *Outside of conventional battlefields*, however, human rights law must predominate. "[T]hese strikes occur outside the territories of the States engaged in hostilities and thus cannot be considered part of an armed conflict subject to IHL. Arguing otherwise will potentially subject non-belligerent civilians and civilian objects to 'proportional' harm [under IHL] simply because 'an individual sought by another State is in their midst.'" (Callamard 2020, para. 35, quoting the International Committee of the Red Cross [ICRC] 2011 Challenges of Modern Warfare). Simply put, collateral damage calculations have no place outside of traditional battlefields. The deaths of those civilians killed in attempted targeted killings are arbitrary killings, prohibited under Article 6 of the ICCPR, as are the deaths of those targeted, unless they posed an imminent risk of death or serious injury to others.

Even on the battlefield, protecting the right to life requires efforts to capture, rather than kill, alleged terrorists or combatants when militarily feasible. As explained by the Supreme Court of Israel in *Public Committee against Torture in Israel v. Government of Israel*:

> A civilian taking a direct part in hostilities cannot be attacked at such time as he is doing so, if a less harmful means can be employed. In our domestic law, that rule is called for by the principle of proportionality. Indeed, among the military means, one must choose the means whose harm to the human rights of the harmed person is smallest. Thus, if a terrorist taking a direct part in hostilities can be arrested, interrogated, and tried, those are the means which should be employed. (Public Committee against Torture 2006)

As stated by the International Committee of the Red Cross (ICRC), it would "defy basic notions of humanity to kill an adversary or to refrain from giving him or her an op-

portunity to surrender where there manifestly is no necessity for the use of lethal force" (ICRC 2009, 82).

2.4 The Second Drone Age: Predictable Proliferation and Further Destabilization

As these targeted killings continued over time, armed drones proliferated. Today, "over 102 different state actors and at least 53 non-state actors" now possess armed drones (Rogers and Kunertova 2022, 4). Relatively cheap armed drones are now available: the drones recently sold to the Russian Federation by Iran reportedly cost only $20,000 per drone (Bowden 2022). There are even reports of non-State armed groups self-manufacturing armed drones with 3-D printers and commercial parts (Rogers 2022; 3D Printing.com 2016). With this proliferation has come a further decline in international humanitarian and human rights compliance beyond the targeted killings: there is an increase in generalized violence and a decrease in accountability.

Drone proliferation has led to more interstate borders clashes and "shadow" wars. Cheap armed drones are elevating the military capabilities of all actors, even small bands of individuals, and increasing the potential for ongoing attacks. In 2020, Azerbaijan used Israeli drones against Armenia in contesting its borders. Kyrgyzstan has acquired Turkish drones and used those to supplement its forces in a border dispute with Tajikistan in September 2022. Iran or non-State actors affiliated with Iran have launched ongoing attacks against the United Arab Emirates and Saudi Arabia, targeting infrastructure such as oil facilities and airports.

State officials are at greater risk of assassination by drone, with some experts concluding that we "have entered a new age of assassinations" (Rogers and Kunertova 2022, 2). In addition to the United States' killing of General Soleimani, there have been three attempted killings of State leaders, with drone attacks on the former Japanese prime minister Shinzo Abe's offices in Tokyo in 2015, the Venezuelan President Nicolás Maduro in 2018, and the Iraqi prime minister al-Kadhimi in November 2021 (Rogers and Kunertova 2022). There will inevitably be more.

In war, the use of drone swarms is increasing because of their ability to overwhelm air defenses (Rogers and Kunertova 2022). So far, these swarms are not "true" swarms, meaning drones "collaborating to achieve shared objectives" (Kallenborn 2020). Yet their impact is deadly. In Ukraine, for example, after significant advances by Ukraine, Russia used swarms of Iranian drones to target energy and other critical infrastructure.

In many of these attacks, there is no accountability, as it is often unclear who launched the drones. For example, responsibility for the drone attack on an Israeli commercial oil tanker off the coast of Oman in July 2021 remains unresolved (Rogers 2021). The G7 and Israel said that evidence pointed to an attack by Iran. However, because Iran supplies drones to a variety of actors across the Middle East, it now has

"drone deniability": this particular attack could also have been launched by the Houthi in Yemen. This uncertainty benefits Iran, in that it can escape accountability, but it also benefits other States, as it allows them to use this ambiguity to keep the "shadow war" from escalating and becoming a hot war (Rogers 2021). As drones become more generic and replicable, "drone deniability" will become even easier.

3 The Third Drone Age – Drones of the Future

Future drone technology will likely accelerate these trends. Two critical advances are in the works: autonomous control of armed drones through artificial intelligence; and autonomous swarms, with the drones themselves coordinating their movement, without human control. Combined, these technologies will allow any individual to launch hundreds, potentially ultimately thousands, of unidentifiable drones to autonomously search for, target, and kill people, based on programmed characteristics. People of a certain ethnicity or race could even be targeted by a malevolent actor. As Stuart Russell, a prominent expert in artificial intelligence, warns, individuals throughout the world will soon have cheap and readily-available weapons of mass destruction (Russell 2021).

Autonomous unmanned mobile weapon systems, capable of swarming, are a focus of all major militaries. Russia intends to use drone swarms "to take soldiers out of dangerous frontline tasks and replace them with expendable robotic systems" and is investigating combining swarming unmanned drones with hypersonic missiles (Bendett 2021). The United States is testing swarming boats and aerial drones, as well as a cluster payload, launched by missile, that would deploy swarms of "smart" quadcopters with small explosives (Kallenborn 2020; SBIR 2017). Turkey's Kargu-2 drone already has swarming capabilities and can target and kill autonomously (Airforce Technology 2021). The UN reported that this drone was used to kill autonomously in Libya in March 2020 (S/2021/229).

The film, Slaughterbot I, suggests what such a world might look like. In this film, quadcopters hunt down one political party within the US Capitol, target people on the street, and massacre activist students throughout the globe, in one case searching for and finding a particular student hiding under his desk (Future of Life 2017). The book *Ghost Fleet* provides a similar depiction (Singer and Cole 2016). Should these drones be developed, unknown State or non-State actors can launch autonomous swarming drones against targets of their choice, with little possibility of accountability.

There are those who claim that these depictions will remain in the realm of science fiction and that countermeasures will protect populations from these effects (Scharre 2017). Perhaps, perhaps not. What is clear is that despite the promise of greater precision, drones to date have increased violations of international law, not decreased them, and there is no reason to believe that trend will be reversed as drone technology evolves.

4 What to Do

There are two parallel trends that must be addressed. The first is the increased liberty States feel in launching armed attacks in violation of the UN Charter and the right to life, and the increased ability of non-State actors to launch similar attacks. Drones are a major component of this trend. The second is the emerging ability of drones to select their own targets, without real-time human control of that targeting. This raises issues of accountability and fundamental legal and ethical questions as to whether machine-targeting of humans should be allowed. There are no easy solutions to either, but an indispensable first step is to eliminate the logjam a few States are creating in negotiating solutions.

4.1 Shoring Up International Law against the Unlawful Use of Force

If the international community is to have any hope of countering the growing trend of perpetual drone attacks, it must re-establish the norm against unilateral State attacks in violation of the UN Charter. It must also re-establish the requirement that the right to life be respected, with capture of suspected terrorists, not lethal targeting. This will require both international and domestic supervision of drone strikes.

First, States must debate and reject the self-serving redefinition of self-defense used to justify many drone strikes. This process has begun, with the Community of Latin American and Caribbean States (CELAC) decrying this rearticulation and demanding an "open and transparent debate." Brazil has joined in the call. Mexico organized an Arria-formula conference at the United Nations Security Council (UNSC) on the issue (Olabuenaga 2019).

The international community should likewise demand the capture of alleged terrorists, instead of targeted killing, with efforts made to develop the necessary institutions to facilitate this. The Biden Administration has recently issued a Presidential Policy Memorandum purportedly prioritizing capture, but the memo is classified and thus cannot form the basis for reasoned debate (Hathaway 2022). States have an obligation to develop cooperative international processes to address terrorism in a manner protective of human rights, despite the ease and allure of armed drones.

In addition, greater international attention needs to be paid to so-called "shadow wars." Experts and international institutions should be encouraged to "publicly classify armed conflicts and situations that may have triggered or are evolving rapidly as an international or non-international armed conflict" (Callamard 2020, para. 91(d)). If the UN Security Council will not take action, the UN General Assembly should debate whether it needs to act.

Finally, domestic legislatures and judiciaries must start supervising drone strikes and requiring adherence to law. A start has been made in the United States with its

Civilian Harm Mitigation and Response Action Plan (US Department of Defense 2022). While still inadequate, including in failing to require review of past casualties, it promises better coordination with civil society in assessing civilian death, as well as dedicated personnel for preventing mis-targeting and conducting investigations (Karlshoej-Pedersen 2022). These types of actions must be supplemented by rigorous legislative review of legal standards and targeting decisions, with public hearings and disclosure whenever possible. A formal mechanism for redress must be established in each State using armed drones.

4.2 The Future: A Ban on Autonomous Armed Drones and the Need for Human Control

While critical, the measures just discussed will not adequately address the dangers of the upcoming third age of drones: autonomous armed drones. The dangers of autonomous weapons are distinct from those of non-autonomous drones, but the history of drones nonetheless provides some guidance. Most particularly, the argument of "precision" is being advanced again, albeit in a modified form, but this time as a justification for autonomy. As before, the motivation behind the argument is to save lives, and it may in fact lead to needed improvements in technology that are beneficial. But the claim that autonomous drones will result in fewer civilian deaths overall is just as faulty as it was for non-autonomous drones, again because of their wider use and collateral effects.

Much has been written about international law requiring human control of weapon systems. With multiple other human rights organizations and experts, Amnesty International has joined the call for, among other measures, a ban on the development, production, use of and trade in autonomous weapon systems that by their nature cannot be used without meaningful human control over the use of force (Amnesty International 2018). The late Christof Heyns, a former Special Rapporteur on Extrajudicial, Summary or Arbitrary Executions, decried autonomous weapon systems and argued that they violated the fundamental right to a dignified life (Heyns 2013; 2017).

In response to these concerns, States increasingly are converging on certain governing principles. Within the context of the CCW, States have called for "meaningful human control," a ban on the targeting of humans, and a requirement of system "predictability, foreseeability, reliability, oversight and explainability" (Human Rights Watch and IHRC 2021, 4). States have also called for assurances of accountability.

Yet, progress has been stymied by a handful of States who have used the rules of consensus to block meaningful regulation. Luckily, the international community appears to be recognizing the need to move the debate to other forums. The Human Rights Council has adopted a resolution led by Panama and Austria that requires emerging military technologies to respect international human rights law and calls out the risks of algorithm-based systems. Costa Rica hosted a two-day regional confer-

ence on autonomous weapons systems in February 2023, resulting in a historic communiqué supported by 33 states from the region calling for "the urgent negotiation of an international legally binding instrument on autonomy in weapons systems." 100 states now support such a legally binding instrument.

Nonetheless, given the intense pressure by a small group of States and corporations to develop these weapons, there are obstacles to achieving effective prohibitions and regulations, and the efficacy of any regulations will turn on whether "meaningful human control" is required and how that is ultimately defined. For that reason one recent trend in the academic literature is worth examining briefly: the argument that human control is overvalued.

4.3 The Elusive Goal of Precision in Drone Attacks

Some experts in international humanitarian law have suggested that because humans are so inherently bad at applying international humanitarian law under conditions of war, autonomous weapons, including autonomous drones, might increase compliance and decrease civilian death (Trabuco and Heller 2022; Jensen 2020). Under this view, autonomous drones could potentially be programmed to distinguish between combatants and non-combatants by recognizing the objective manifestations of combatant status, as well as objective indications of surrender and other means of being "hors de combat."

While this argument accurately describes the many deficiencies of humans, it overestimates the likely abilities of machines, mainly because it posits imagined future machine abilities. The artificial intelligence driving autonomous weapons, including drones, is increasingly developed on neural nets, where the process by which the machine reaches its decisions is fundamentally unknown. An autonomous weapon system would learn IHL through supervised learning on data sets, or a similar process, and likely would continue to learn on the battlefield. This type of artificial intelligence is prone to the now well-known problems of "black box" decision-making, bias and brittleness, flaws that undermine the predictability and reliability required to "connect[] human agency and intent with the eventual outcome and consequences of the machine's operation" (ICRC 2018, 21).

Specifically, there is no guarantee that the reasoning of autonomous weapons will bear any relationship to principles of IHL. There are multiple examples of artificial intelligence coming up with the "right" answer, but it is later determined that the reasoning was faulty by human standards. For example, during the pandemic, doctors attempted to use artificial intelligence (AI) to help distinguish positive Covid x-rays from negatives, only for it to be determined later that some of the AI models were distinguishing x-rays based on the labeling of the scans, not on the underlying biology (Savage 2022). *Ultimately, it is highly unlikely that the means by which an autonomous*

weapon system decided compliance with IHL would be recognizable to a human: it is not human thinking.[1]

Bias in the training of the autonomous weapon would also be a problem: societal bias often gets incorporated into data sets, and thus into the performance of the artificial intelligence. Too often, bias is discovered after a particular artificial intelligence system has been deployed, a situation that cannot be tolerated in military operations. It is even possible that an autonomous weapons system would be trained on data from some of the faulty strikes of the past 20 years, teaching the system the very mistakes it is hoped it will avoid.

Finally, artificial intelligence is brittle in ways that are inherent and unfixable. For example, visual recognition systems have a known failure mode where, in certain conditions, they can be fooled to misinterpret what they are seeing – even though a human, seeing the exact same thing, would not be tricked. This is because the way AI "sees" is fundamentally different than human vision (Scharre 2018). A similar phenomenon has been experienced with self-driving cars, which have misinterpreted stop signs with stickers on them as speed limit signs, a mistake humans would not have made (Mogg 2017).

Even if we could fix these particular problems, "we should definitely assume" that newer AIs will have "some other 'counterintuitive, weird' vulnerability that we simply haven't discovered yet" (Scharre 2018, 185, quoting Jeff Clune). As one expert committee concluded:

> [I]t is not clear that the existing AI paradigm is immediately amenable to any sort of software engineering validation and verification. This is a serious issue, and is a potential roadblock to DoD's use of these modern AI systems, especially when considering the liability and accountability of using AI in lethal systems. (Scharre 2018, 186–187, quoting the Jason Group)

Simply put, autonomous weapon systems might also have their My Lai massacres, but it will be due to something we will not have anticipated and might not even understand.

More broadly, the focus on IHL compliance in individual drone strikes is too narrow a lens, just as the focus on precision for non-autonomous drones has masked larger issues. The past two decades have shown the destabilizing effect of drones on the international order, with increasing violations of international law, not because drones are imprecise but because they encourage acts of violence due to their lower cost and availability and the difficulties of identifying the source of the drone. They also dehumanize the targets, a phenomenon likely to worsen with autonomous weapons. Those initiating

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1 Under these circumstances, it is unclear how an autonomous system would demonstrate compliance with IHL. Typically, some understanding of the reasoning behind an attack is necessary, even if it is based on circumstantial evidence. Current foundational models of artificial intelligence do not allow insight into the perception and reasoning of the machine, and thus will not allow a basis for determining full compliance with international law.

war are too distant from the killing, thereby "enhancing existing asymmetries and making the use of violence easier or less controlled" (ICRC 2018, 9).

While these "externalities" are noted by those suggesting the potential for greater IHL compliance through artificial intelligence, they require greater attention. They are as important as – if not more – than the precision of a particular strike. If we are to ensure compliance with humanitarian and human rights law generally, these wider societal impacts must be a core focus.

5 Conclusion

There are regions today where populations live under the continuous surveillance of drones, with a constant fear that they will be killed or maimed by drone strike. Their experience should be a warning and a clarion call for reform. The continued proliferation of drones and the development of autonomous weapons risks subjecting the entire world to the same life of fear and dread. Just as proliferation and the generalization of risk has in the past led States to agree to regulation and controls of particularly dangerous or inhumane weapons, so should it do so here. The world of readily-accessible armed drones, particularly if autonomous, is not one in which any of us would want to live.

Seminar Questions

1. To date, has the use of armed drones increased or undermined compliance with international humanitarian law and international human rights law? Explain.
2. What changes in the interpretation of self-defense under the UN Charter has the United States and others proposed as justifying their use of armed drones and what is the international reaction to these proposed changes?
3. Could autonomous drones increase compliance with international humanitarian law and in evaluating this compliance, what beyond the precision of an individual strike should be taken into account?
4. Are autonomous armed drones potentially weapons of mass destruction and if so, what steps could be taken to regulate or ban their development, production, trade and use?
5. Should there be a legally binding international agreement on autonomous weapon systems and what should it require? Should it include a ban on the development, production, use of and trade in autonomous weapon systems that by their nature cannot be used without meaningful human control over the use of force?

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J. Wesley Hutto

30 Drone Proliferation and IR Theory: Visions for the Future

Abstract: The question of why states acquire drone technology is well traversed. This chapter approaches the issue of armed drone proliferation from a slightly different angle. In it I ask, “what is the meaning of drone proliferation and what does it hold for the future of world politics?” This question presupposes that the acquisition of armed drones may mean different things to different actors. Arnold Wolfers famously referred to national security as an “ambiguous symbol.” In this same sense, the acquisition of armed drones has an ambiguous meaning. It is only through probing the possible meanings of drone proliferation that we might uncover a vision of future world politics in which armed drones are ubiquitous. This is also a system-level question, prompting an investigation of the systemic impacts of drone proliferation. To this end, I employ three competing assumptions about world politics, loosely adapted from traditions of International Relations – anarchy, interdependence, and society – to examine varying global futures under drone proliferation. The findings suggest that the proliferation of drones will complicate the management of violence by great powers, challenge international liberal rules and norms, and agitate existing fissures between the Global North and Global South.

Keywords: Anarchy, interdependence, international society, drones, proliferation

1 Introduction

Thirty-nine states[1] in the world currently possess armed aerial drones.[2] In 2010 this number was a meager three, marking a 100% annual increase in armed drone proliferation over the last 12 years (Bergen, Salyk-Virk, and Sterman 2020). We should expect that as these technologies become more prevalent and accessible, armed aerial drone proliferation will continue at an accelerated pace.

This chapter approaches the issue of armed drone proliferation from a slightly different angle than past research on drone acquisition (Horowitz, Kreps, and Furhmann 2016; Furhmann and Horowitz 2017; Boyle et al. 2017; Milan and Tabrizi 2020; Horowitz, Schwartz, and Furhmann 2022). In it I ask, “what is the meaning of drone proliferation and what might it hold for the future of world politics?” This question presupposes the

1 This number is disputed somewhat (see Cole 2022).
2 The chapter transitions between “armed aerial drones,” “aerial drones,” and “drones” depending on the context of use.

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acquisition of armed drones may mean different things to different actors. Arnold Wolfers (1952) famously referred to national security as an "ambiguous symbol." In this same sense, the acquisition of armed drones has an ambiguous meaning. It is only through probing the possible meanings of drone proliferation that we might uncover a vision of future world politics in which armed drones are ubiquitous.

There is also a system-structure question entangled in the broader question of meaning: "What are the systemic effects of ubiquitous drone proliferation?" To examine varying global futures under drone proliferation, I employ three competing assumptions about the underlying nature of international politics: anarchy, interdependence, and society. These assumptions create a foil for examining varying systemic potentials of drone proliferation, prompting three similar but distinct questions: What is the meaning of drone proliferation in a world dominated by anarchy? What is the meaning of drone proliferation in a world of pervasive interdependence? What is the meaning of drone proliferation in a social world; how does ubiquitous proliferation impact international society?

The chapter proceeds with the conceptual development of each assumption, assessing the foundational logic underlying each, followed by the theoretical application of the assumption to the next drone age. Each application is aided with the use of real-world examples. What is produced in each section is a 'vision' of drone proliferation. Visions are multiple, subjective, and contain competing meanings. Visions do not necessarily tell us everything that we need to know. They have peripheries and are not holistic or comprehensive. This chapter, therefore, has certain limitations. Due to space constraints, certain theoretical schools and traditions go unmentioned. The anarchical logic of offensive realism is left out to make room for a more detailed overview of its defensive counterpart. Other theories are synthesized and simplified. Daniel Deudney's (2007) concept of interdependence is equated with Robert Keohane and Joseph Nye's (1977) complex interdependence to produce coherent linkages between democratic governance and liberal institutional commitments. Conventional discussions of international society crowd out progressive discussions of world society and all conversations privilege the state over the individual. These are simplifications – some might argue oversimplifications. We have yet, however, to explore theoretically the impacts of drone technology on international political and social affairs. The best way to begin this exploration is with simplifications onto which we can build reasonable characterizations of the mechanisms involved in drone proliferation and its systemic impact. Anarchy, interdependence, and society provide fundamental and competing starting points for addressing this question.

2 Anarchy

Anarchy is the fundamental assumption of the defensive realist school of International Relations, which argues that the most important actors in international politics are states due to their exceptional ability to extract resources and monopolize violence over units of territory (Tilly 1982). The "orderless" anarchic system of states, without a global leviathan to determine the outcome of disputes, primes states to compete for finite resources and, most importantly, finite amounts of security. In a world in which states cannot be certain of the intentions of their competitors, the international imperative is "take care of yourself!" (Waltz 1979, 107).

In this sense, states are security maximizers who pay particular attention to relative international distributions of capability (Waltz 1979; Walt 1987; Taliaferro 2000).[3] Defensive realists assume that states are always assessing the capabilities of other states and react to concentrations of power, building their own capabilities to balance against the most powerful actors. As states seek to build their resources, this inevitably threatens the security of other states, generating a security dilemma (Jervis 1978). The acquisition of military technology and securing technological advantage, is then, a function of states' tendency to maximize security in the face of external uncertainty (Gilpin 1981; Buzan 1987; Horowitz 2010).

Because survival is staked on state performance in international competition for security, states are socialized by this competition to mimic the actions of historically successful states (see, for example, Resende-Santos 2007). It is perhaps for this reason that military advantages through innovative technology have been historically fleeting (Gilpin 1981, 60). Innovations and technological developments that ease the act of securing territory, as well as extracting and mobilizing resources are coveted and pursued by states. Serious technological advantages generate permissive environments internationally, with some areas left vulnerable to intervention and expansion due to their disadvantage. We should expect states in this situation to "imitate the military innovations contrived by the country of greatest capability and ingenuity" (Waltz 1979, 127).

Thus, the competition for security yields temporary technological advantages and these advantages are naturally balanced out through a state socialization process that encourages innovative mimicry and technology proliferation. What this broadly describes is the theory of offense-defense balance, which suggests that conflict avoidance is dependent on the defense being the stronger form of war (Levy 1984; Van Evera 1990; Glaser and Kaufman 1998). Security maximization is difficult in the absence of effective deterrents, which hinge on their ability to affect the cost-benefit calculus of the opposition (Schelling 1966). These added costs can be thought of as forms

3 There is, of course, a debate within neorealism over whether great powers pursue power maximizing or security maximizing strategies (see Lynn-Jones 1998; Frankel 1996; Brooks 1997). I do not weigh in on this debate.

of deterrence. The effect of this balance is a closing of permissive environments by new added costs on state intervention or expansion (Schweller 2011, 177).

In sum, anarchical worlds are governed by the logic of balancing. Each state competes with the other to secure its territorial borders from threats (Walt 1985). In so competing, states emulate successful practices including (but not limited to) the adoption of new technologies. State adoption of new technology can generate more effective ways to impose costs on potential aggressors, thus reinforcing the world of balancing. These fundamental assumptions are not entirely theoretical, but instead are found in the motivations and meaning of drone proliferation today.

2.1 Defensive Visions of Drone Proliferation

States pursue armed drones to maximize their security. Constantly assessing the capabilities of others, states have begun to recognize the cost-effectiveness and utility of armed drone technology (see, for example, Rogers and Goxho 2022). In turn, states see the opportunities that drones may afford for homeland defense, and the threats that drones may raise on the battlefield.

States concern themselves with the armed drone proliferation of other states because of the security dilemma. The dual-use capability of drones drives uncertainty regarding its intended use. Analysts note that battle tanks are more vulnerable now than ever, especially when mobile units lack short-range air defenses, electronic warfare assets, and counter-drone systems (Urcosta 2020; Kasapoglu 2020). Even when mobile units have some air defenses, certain systems remain vulnerable due to drones' small radar return. In Nagorno-Karabakh, for example, the Russian Pantsir S1 anti-aircraft artillery systems were no match for Turkey's Bayraktar TB-2, now known as "Pantsir hunters." Russia has since adjusted its Pantsirs outer shell to account for the Bayraktar threat, but this did not help avoid the damage of armed drones in its initial invasion of Ukraine (Soylu 2022). Additionally, for states that lack GPS capability, or in degraded combat environments, drones can operate in lieu of satellites as geolocation targeting technologies for indirect fire. Drones combined with indirect fires in both Syria and Nagorno-Karabakh, and Azerbaijan relied heavily on this capability during its conflict with Armenia (Dixon 2020).

As more states acquire high-end drone technology, a balance will form regionally and globally. Territories and regions that have previously been relatively permissive with porous borders and easily exploited by regional or great powers, may prove more readily monitored and defended by armed drones. The stymied Russian invasion of Ukraine, and the role armed drones played in Ukraine's defense, has proved this to be – at least in part – true. The relative low cost of many drones means that historically smaller states will have more resources to defend their air spaces. This is not to say that drones provide, by themselves, the capability to withstand a conventional offensive. But it does provide some new costs to consider when militaries move into sovereign territory or

potential combat zones. In this sense, drones are weapons of sovereignty, reinforcing the post-Westphalian state.

In effect, drones may provide "deterrence by detection." The Center for Strategic and Budgetary Assessments (Mahnken, Sharp, and Kim 2020), for example, argues that placing only 92 uninhabited systems in Eastern Europe and the Western Pacific would impact the political calculations of Russia and China in two ways. First, these assets might have the effect of deterrence by denial by generating enough real-time intelligence, surveillance, and reconnaissance (ISR) to recognize and expose nefarious actions before actors would be able to reach their objective. Secondly, the psychological effect of having active ISR assets able to be observed may lessen the likelihood of opportunistic acts of aggression. In this role, drones would serve as assets that communicate a watchful eye for any action that seems to skirt the threshold for conflict, and the capability in this case is not the ability to impose cost, but the ability to report detailed data about those actions in real time, to spur quicker on-the-ground responses by allies and partners (Mahnken, Sharp, and Kim 2020; see also, Rogers 2023). In this sense, drones do not by themselves have ability to manipulate cost/benefit calculations, but rather it is the conventional assets that lie behind them that matter. In the situation outlined here, the presence of armed drones is about signaling the readiness of conventional capability, since the damage an armed drone can deliver on a state actor like Russia or China is limited. The strategic role of drones in this case, then, is found primarily in their combination with crewed assets and larger weaponry.

Drones take a more central role in new thinking around strategic missile defense. Airborne early warning is historically performed by large, crewed aircraft like E-2s and E-3s (Stutzriem et al. 2021). The risk is often too high, however, to send these aircraft into contested airspace, especially when other uncrewed systems can perform the necessary tasks. In the Western Pacific, the idea is that UAS will be able to fill the gap between the coast of China and the second or third island chain, sending real-time information to where E-2s and E-3s can operate safely and unimpeded (Stutzriem et al. 2021). In Eastern Europe, as well as in the Arctic, the thinking is that if enough drones are deployed in air patrols, this can generate a resilient web of detection that will be able to spot early signs of missile launch, as well as a possible interception of such missiles. Assuming that the capabilities are there, however, drones would serve to cultivate a reputation for skill at surveillance that would contribute to deterrence by denial, dissuading enemy aggression in contexts where the success of attack is low or questionable (Mahnken, Sharp, and Kim 2020).

In the end, the future of world politics under heightened drone proliferation may be more stable, not less.[4] Armed drones offer to their state-owners a dual-use technology, capable of surveilling borders for long durations, detecting potential aggressions through intelligence and reconnaissance, and striking aggressive targets. We have seen these capabilities on display on the battlefields in Syria, the Nagorno-Karabakh, and most recently, Ukraine, and its viability imposes on potential aggressors a new cost calculus when weighing intervention in domestic or regional political environments. In turn, this cost may outweigh the benefits of action. To paraphrase Kenneth Waltz, "more drones may be better."

3 Interdependence

Neoliberal institutionalism's central contribution is its recognition of the unparalleled level of interdependence that industrialization and global capitalism generated across modern states and international actors (Starr 2007).[5] "Extensive flows of goods, raw materials, people, and capital across borders benefit all countries involved, and often are critical to each country's economy" (Milner 2009, 15; see also Keohane and Nye 1977). The benefits of these cross-border flows, commercial and otherwise, incentivize actors to regulate their relationships in effort to reduce uncertainty by creating mechanisms for transparency. For neoliberal institutionalism, the history of the state system is one of increasing interdependence and institutionalization through both intergovernmental and nongovernmental organizations, laws, and other mechanisms of global governance created to manage it.

In contrast to defensive realism, then, neoliberal institutionalism does not perceive a world dominated by anarchy, but rather one that is driven by varying levels of interdependence into institutional orderings. A tradition with both normative and positivist ends, neoliberal institutionalism is idealistically committed to the realization and extension of liberal norms and values, as well as analytically interested in the imposition of the *democratic* state onto the international and its creation of new forms of global governance (Dewey 1927).[6]

For the analytical neoliberal institutionalist, the process of institutionalization maps international developments from loose cooperation toward regime formation.

4 Nonstate actors' use of cheap drones to impose new costs on states will be of concern, of course, but as the technology advances a realist vision of the world would have us concern ourselves with the actors that can best extract and mobilize the resources to acquire high-end armed military drones.

5 While a "transmethodological consensus" seems to exist regarding the anarchical character of international politics (see Legro and Moravcsik 1999; Milner 1991), this chapter simplifies the discussion and leverages interdependence as the orienting principle of liberal analyses.

6 For description of the shared values and anticipated international behavior by liberal states see Doyle (1983a; 1983b) and Sørenson (1992).

International regimes are "principles, norms, rules, and decision-making procedures around which actor expectations converge in a given issue-area" (Krasner 1983, 2; also see Keohane 1989, 3; Young 1989). To be in accordance with their set norms and rules, functional regimes necessitate that members cede some state autonomy over certain policy areas. In other words, they are painstakingly developed. Deudney and Ikenberry (2021) view international institutionalization as a direct response to the technological developments of the modern age. The modern state and its institutions expand to "curtail the negative externalities" produced by new means of death (Deudney and Ikenberry 2021, 12). The quintessential example of this process is the advent of nuclear weapons and the subsequent arms control regime (Deudney 2007).

From a normative perspective, the primary incentive of democratic expansion and international institutionalization is the protection of human health (Keohane 1989).[7] In short, it is in the state's interest to take care of its people, as they are the building blocks of state wealth. The Responsibility to Protect Doctrine (R2P) is perhaps the most famous mechanism by which this international protection is distributed, but other mechanisms include multinational peacekeeping operations as well as humanitarian aid and disaster relief. The 'order' created by international regimes is thus sanctioned by international institutions and sustained or enforced by their state-members.

In sum, neoliberal institutionalism provides a vision of the world as one governed collectively by states, institutions, and their associated laws, rules, and norms. States are incentivized to regulate zones of intense interdependence to protect the mutual benefits incurred by commercial and national cross-border activity (Keohane and Nye 1977). New technologies of violence create new or intensified security interdependencies in need of regulation (Deudney 2007). State adoption of these new technologies may assist in the enforcement of international laws, rules, and norms, providing however, that their very use does not undermine the order itself. The liberal vision of future proliferation of armed drones straddles this contradiction, in one sense aiding the protection of people and enforcement of international order, in another sense undermining both.

3.1 Interdependent Visions of Drone Proliferation

The liberal international order's vulnerability to attack provokes democratic states and institutions to acquire armed drones for enforcement purposes and to regulate their proliferation to undesirable state and nonstate actors. In so doing, certain contradictions surface between the democratic regulation of drones and their use by many of the same states (especially the United States). This suggests that the prolifera-

7 The analytical-normative divide outlined here is not strict. As Keohane (1989) suggests, neoliberal institutionalism has incorporated as a prerequisite the need to preserve human welfare.

tion of drone technology will present a significant challenge for the future strength of the liberal international order.

Drone proliferation is as much a multinational commercial issue as it is an issue for states. The number of countries with indigenous drone production capabilities has grown from four in 2005 to twenty-nine by 2019 (Bergen, Salyk-Virk, and Sterman 2020), and TealGroup (2022) estimates that over the next decade civil drone sales will exceed $120 billion. Many of these programs are directed toward civilian use, but as Marcus Schulzke (2019, 498) notes, there being no "sharp division between military and civilian" drones.

The dual-use capability of drones poses challenges to their regulation since commercial drones are easily modifiable for military purposes. Modified drones have already taken center-stage in some high-profile terrorist events. In 1994, for example, a Japanese cult attempted to murder the leader of a rival organization by weaponizing a small drone with sarin gas (Pledger 2021). Even without military modifications, drones can still threaten the everyday working of international order. In 2018, the UK's Gatwick airport was shut down for over 30 hours due to a simple but persistent unconfirmed drone sighting (Mueller and Tsang 2018). The shutdown disrupted the flights of nearly 150,000 travelers (Pérez-Peña, Tsang, and Mueller 2019). We should expect that as commercial technologies advance over the next decade, the danger of drones to vulnerable nodes of interdependence will increase across the liberal order (Carter 2022). The economic impact of such potential attacks is incalculable.

States with large stakes in the international order, therefore, should be inclined to do all they can to regulate drone proliferation and mitigate any future disruption to cross-border flows of goods and people. To this end, drones have been adopted into outstanding arms control arrangements, specifically, the Missile Technology Control Regime (MTCR) and the Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies. Additional conventional arms treaties such as the United Nations Arms Trade Treaty (ATT) also appear to cover drone proliferation.

The MTCR, Wassenaar, and the ATT offer transparency, impose rules, and invoke the responsibility of states to avoid the transfer of arms technology that could be used to violate the rights of people (Buchanan and Keohane 2015; Clarke 2021; Kreuzer 2022). The 35 signatories of the MTCR, for example, agree to limit their export of advanced drone technology to each other. Founded by and made up primarily of liberal democratic states (with a few notable exceptions, including the Russian Federation), the MTCR amounts to a small club of states to be inherently trusted with certain technologies.[8] This is the case because it is impossible to separate discussions of drone proliferation from their future potential use. The ATT (UN 2014, Art.6(2)) is a perfect example of this, openly stating:

8 According to MTCR, these would be Category I drones, determined by their range and payload capability. For description, see Davenport (2021) and Nacouzi et al. (2018).

> A State Party shall not authorize any transfer of conventional arms [. . .] if it has knowledge at the time of authorization that the arms or items would be used in the commission of genocide, crimes against humanity, grave breaches of the Geneva Conventions of 1949, attacks directed against civilian objects or civilians protected as such, or other war crimes as defined by international agreements to which it is a Party.

Thus, the drone export practices of the 106 parties to the ATT may be held to account by international humanitarian law (IHL) according to how the importers plan on using the technology (Clarke 2021). When overlayed by the rights and responsibilities of the MTCR, the subtext of the ATT's language presupposes those members of the club will use drones in accordance with the *jus in bello* principles regarding distinction and proportionality, codified in IHL (Kaag and Kreps 2014).

In the abstract sense, the precision, persistence, and low cost of drones make them ideal technologies for distinguishing civilians from military and conducting proportional strikes against military targets (Grieco and Hutto 2021). In practice, however, these are not so easily sorted. John Kaag and Sarah Kreps (2014, 90) note the blurriness of the civilian-militant divide and draw focus toward the difficulty of reinstating legal protection to militants who have returned to civilian life.[9] Others suggest that drones have "respacialized" the practice of war, eliminating the separation between civilian spheres and battlefields guaranteed by IHL (Gusterson 2016; Ryan 2014). The debates around these issues are particularly important since it is their outcome which will ultimately determine future interpretations of international law regarding the use of drones (Kennedy 2012, 166). The US seems to be a standout case in this regard, with much of the concern regarding violations of *jus in bello* centering on its global war on terror and the unprecedented 2019 strike against Iranian General Qasim Soleimani (HRC 2020; see also Troy 2018). Most drone operating states, however, appear to abide closely with international laws and norms around proliferation and use (Theussen 2021).

Unarmed drones operating outside of a warzone, however, also present issues. Even as drone use widens to serve in humanitarian operations – such as those during Hurricane Katrina in 2005 – their use in cities and along national borders reveals a desire to monitor, surveil, and ultimately control the movement of individuals (Wall and Monohan 2011). During the 2020 Black Lives Matter protests following the murder of George Floyd, for example, the US Department of Homeland Security systematically used aerial drones to monitor protesters' activity (Kanno-Youngs 2020). At the height of the Coronavirus crisis, France deployed drones to enforce its lockdown (Noack 2021). This expansion of the police-state failed given strict French privacy laws, but it is one example of a potential future struggle between state surveillance advocates and individual rights activists.

9 The problem of defining civilian with regards to drone use is well traversed by Jimenez-Bacardi (2022).

In effect, the next drone age presents a significant challenge to the future of the liberal international order. Drones unearth a key internal contradiction to liberalism. They are first a humane means of enforcing international laws, rules, and norms, protecting vulnerable nodes of interdependence, and enforcing key aspects of international order (Kennedy and Rogers 2015). Thus, whether it be through the MTCR or some other accountability mechanism (Buchanan and Keohane 2015; Callamard and Rogers 2020; Kreuzer 2022), regulating their proliferation to trusted actors will be a priority for those states with stakes in the international order. Yet in turn, their increasing use risks violating the individual rights and liberties they are supposedly intending to protect and enforce. Whether an effective drone regime that ensures the protection of individual privacy can develop is an open question (Jacob and Mathieson 2022).[10] Neoliberal visions of drone proliferation highlight the future challenge to the liberal character of the international order.

4 Society

That the system is undergirded by neither anarchy or interdependence but by an anarchical *society* is the central contribution of the classical English School (ES), and in many ways provides a *via media* between defensive realism and neoliberal institutionalism (see, for example, Buzan 1993). Because ES's primary contribution is that all international relations (formal and informal) are governed by rules, the regimes discussed above do not simply exist in cooperative legal or institutional settings, but they are a "pervasive phenomenon of all political systems" (Krasner 1983, 8; see also Buzan 1993; Hurrell 2002). The balance of power, war, diplomacy, international law, and great powers are considered as individual regimes, or "institutions," each with their own shared understandings, principles, and norms (Bull 1977). These institutions make up what the ES refers to as international (anarchical) society.

International societies exist, according to Hedley Bull (1977 13), "when a group of states, conscious of certain common interests and common values, form a society in the sense that they conceive themselves to be bound by a common set of rules in their relations with one another, and share in the working of common institutions." States are therefore the principal actors in this regard, being "chiefly responsible for making the rules effective" (Linklater and Suganami 2006, 52).[11] Great powers in particular

10 For a summary of European responses to drones and privacy, see Baudouin (2021).

11 Bull did not deny the contribution of individuals and nonstate groups to international society. In fact, non-systemic ES theories such as cosmopolitanism and international citizenship have grown out of Bull's conceptions of a potential "world society" (Linklater and Suganami 2006). Yet, Bull (1977, 21) saw the historical political development of international society as one that was overwhelmingly state-centric.

provide an important service, being responsible for the promotion of international order, or a “pattern of activity” that serves the goals of international society (Reus-Smit 1997, 557).

Historically, ES scholars gravitated toward assessments of religion or language to assess the character of past international societies (see, for example, Butterfield 1953; Bozeman 1960). More recently, Barry Buzan (2004, 107) pushed to integrate assessments of system-structure into characterizations of international society, arguing that while “polarity does not determine the nature of the game,” it does “affect how the game will be played.” Accounting for system characteristics like polarity yields two important insights. First, “the consciousness of [international] society” is informed in part by the hierarchies of any given system. In this way, defensive realism’s attention to power is intrinsically linked with the law and order of neoliberal institutionalism (Bull 1984, 217–218). Second, power and law act upon each other in varying capacities depending on the social nature of an international society – whether state behavior is driven by coercion, calculation, or belief (Buzan 2004; Wendt 1999). This means that in certain societies, great power hierarchies are reinforced through the functions of international law, diplomacy, and war (Bull 1984).

To understand the character and strength of institutions in any given society, therefore, its rules and practices must be “set against the cultural and historical forces that helped shape the consciousness of society at any particular time” (Hurrell 2002, xi). In other words, to assess the character of international society, we must assess the political, cultural, and social structures of the period under review (see Buzan and Little 2000).

In other words, material and legal factors take on certain social meanings in international society. ES theorists have long held, for example, that international law creates rights and duties for states in contemporary international society (Manning 1972; see also, Linklater and Suganami 2006). More recently, as well, ES scholars identified the social function of “high-visibility technology” as a “standard of civilization” for states today (Stroikos 2020), bringing the ES in line with constructivist arguments regarding certain technologies as a means by which states elevate their prestige or challenge established hierarchies (Suchman and Eyre 1992; Hironaka 2017). Again, international law and power seem to be in tension, as ‘haves’ create laws to perpetuate international hierarchy and the pursuit of material technology by have-nots may undermine it.

Summarily, the ES provides visions of world history as fluctuations between thinner and thicker forms of international society. Thinner international societies lack a sense of ‘we-ness’ and a commitment to common interests, and behavior is motivated through coercive practices. In contrast, thicker international societies feature rules and practices embedded in a united economic and political system and state behavior is motivated by belief (Bull and Watson 1984, 7). Where a society exists on this spectrum is indicative of its health and durability. This point is particularly important for an account of 21st-century international society.

Bull's account of the history of the 20th century was marked by the progressive erosion of western dominance through decolonization and the rise of the Global South (Hurrell 2002, xviii; see also Bull 1984). Analogous forces mark international society today: global anti-racism movements and the rise of Global South organizations such as BRICS (Brazil, Russia, India, China, and South Africa), and the economic, military, and political rise of China all suggest a continuing degradation of international society. ES visions of drone proliferation offer a window into this progressive decline and a possible bifurcation of international society.

4.1 Societal Visions of Drone Proliferation

The role of drone proliferation in international society has largely involved what Hugh Gusterson (2016, 148) refers to as the "stratifying" of global society.[12] States in the Global North have been quite successful at developing, using, and sharing drone technologies with one another under the framework of the MTCR, yet the regime's outstanding membership suggests that few states from the Global South have gained inclusion into this club. This serves as a reinforcement mechanism for the dominance of the Global North in international society. Nevertheless, the prestigious social meaning of drone technology suggests the inevitable acceleration of proliferation among Global South states (see, for example, Williams 2022; Suchman and Eyre 1992; see also chapters in this volume by Lukas Fiala and Sibel Düz). Likely, the method by which this proliferation is currently taking place will further erode international society.

Established in 1987 by Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States, the MTCR as noted above, amounts to a small club of states inherently trusted with missile technologies, including aerial drones (MTCR 2010). Members commit to coordinating their export licensing among themselves to prevent proliferation of category I items outside of the club, identifiable based on their range and payload – no further than 300 km range and no greater than 500 kg (Nacouzi et al. 2018, 10; Clarke 2021, 324). Category II items are subject to less restrictions and thus more abundant in international trade flows, but according to a recent RAND report fewer than 15 states operate category I drones (Nacouzi et al. 2018, 11). Even China, a major drone producer and non-signatory to the MTCR has made commitments to abide by regime export standards and seems to be adhering to the letter of that commitment (see Nacouzi et al. 2018). The many constraints around drone exports underline James Rogers's (2021, 482) comment that "Decisions about who joins the 'global drone club' are not made by accident."

12 Much work has been done on the role of drones in counterterrorism and the consequent reinforcement of the state versus nonstate distinction (see, for example, Williams 2022), so my commentary in this section is limited to hierarchies among state actors.

Recent work in the production of international law treats the Global South as a relational category that calls attention to various "marginalizations within international hierarchies" (Bergen 2021, 2001). These marginalizations seem to carry into the drone proliferation regime. Of its 35 signatories, the MTCR maintains only four members from the Global South: Argentina, Brazil, India, and South Africa (MTCR n.d.). As Michael Kreuzer (2022, 220) notes, the nature of the regime creates a contentious dynamic between MTCR members and non-members. Further, the large overlap between MTCR-membership and the Global North reinforces the social meaning of drones as "standards of civilization" (Williams 2022), increasing their desirability as technological symbols of progress and modernity (Suchman and Eyre 1992).

The US has been criticized by some for its severe adherence to restrictions, going so far in two instances to decline export to New Zealand and Brazil, both signatories of MTCR (Nacouzi et al. 2018, 39; see also Kreuzer 2022). There is thus a "strong presumption of denial" among non-MTCR states that precludes them from even requesting the sale of category I drones from the United States (Nacouzi et al. 2018, 38). China has taken advantage of this vacuum left in the wake of US denials, selling category II systems that skirt the lines of category I measures to states previously denied sale by the US (Page and Sonne 2017). China's Wing Loong II, for example, has a payload ceiling of 480 kg restricting its travel distance to under 300 km (Hambling 2020). Many, if not all drone exports by China have been to states in the Global South, including Algeria, Nigeria, and Uzbekistan (Nacouzi et al. 2018, 15).

Many analysts view the Chinese sales as concerning. Rogers (2021, 491), for example, suggests that China is using its drone exports to move into "regions deemed strategic chokepoints," and Nacouzi et al. (2018, 3) claim that China eventually intends to export category I items to non-MTCR members. So far, however, China's exports do not seem to violate the restrictions of the MTCR, as they fail to exceed the range and payload limits set by the regime. Nevertheless, China has cornered the drone market, and "maintains a 3:1 ratio of armed and networked drone sales" relative to the US (Blaxland, Bose, and Lushenko 2022, 248). What seems clear is that the letter of the regime and the regime's intention seem to be rupturing. China's exporting practice undermines the US ability to leverage drone technology in diplomatic bargaining, and as China attracts buyers with few strings attached, competition between the past and rising great powers "will likely accelerate the proliferation of military-grade drones" (Lushenko, Bose, and Maley 2022, 24). Indeed, the US has already lifted many of its export restrictions in order to better compete with China in the international drone market (Burgers and Romaniuk 2018).

What can this tell us about the durability and stability of contemporary international society? Specifically, is the MTCR indicative of a working international society? The simple answer is, "kind of." Signatories and non-signatories alike have agreed to the non-proliferation of category I items and have not yet violated these restrictions. That China in particular, continues to abide by the "letter of the law" is an important insight into the common interests and values that the MTCR embodies. But the MTCR is a small club founded and inhabited by primarily Global North states and, to para-

phrase Bull (1984, 217), its rules "were also in substantial measure made *for* them." The accelerated proliferation of category II drones, especially the items RAND refers to as "near-category I" (Nacouzi et al. 2018), challenges the intention of the MTCR and undermines its stakeholders.

The sections on anarchy and interdependence demonstrate that drone proliferation cuts across each institution of international society. Drones shift the balance of power by complicating potential great power operations abroad, their armed and unarmed utility outside of warzones create unresolvable tensions in IHL, and their future ubiquity will complicate great power diplomatic relations. If societies and their institutions are held together by coercion, calculation, and belief, the current state of drone proliferation suggests that contemporary international society is held together by a strict mixture of coercion and calculation. Currently, drone proliferation reflects shifting power dynamics in the international system and as a result seems predominantly calculative. As the hierarchies of the US and the Global North continue to erode, however, it seems reasonable that previously recognized common interests and values will no longer be, and a society based on coercion the result. Hedley Bull (1977, 121) worried about nuclear weapons preventing the ability of international society to sustain itself on a more positive basis, and the trend appears just as predominant in the politics of drone proliferation.

5 Conclusion

Centering focus on the ambiguous meaning of drone proliferation contributes to the quickly accumulating drone literature by providing a bridge between individual state motivations for drone acquisition and the system effects of widespread acquisition. This brief overview cannot cover the entire range of realist, liberal, and English School argumentation regarding the current and next drone age. These traditions are grand, and each hosts numerous debates, theoretical divergences, and competing epistemologies. Instead, this chapter provides only a starting point for using these lenses to imagine the systemic effects of accelerating drone proliferation. With this in mind I offer a few concluding points.

First, the arguments here pose three potential futures, one in which drones contribute to international stability by increasing the costs of invasion and war, another in which drones expose and agitate the internal contradictions embedded in liberal universalism, and a third that prioritizes the social in- and out-groups that develop and intensify around international law and privileged technologies. Additionally, each vision produces policy advice (primarily for current drone powers) for dealing with accelerating drone proliferation. Anarchical visions, for example, recognize the inevitability of ubiquitous proliferation. When appropriately integrated into conventional military capabilities, aerial drones can serve an important function in border

defense and the enforcement of state sovereignty, offering a certain level of international peace and stability. Interestingly, the tradition famous for its pessimism is the only one to offer a somewhat optimistic vision of the future of drone proliferation.

Interdependent visions, on the other hand, provide a clarion call regarding the health of the liberal international order. Liberal policymakers should concern themselves with the follow-on effects of drone proliferation. Continued use outside of warzones, including the use of drones for monitoring civilian activity is likely to degrade the health of democracy and erode the liberal international order. Crucial attention must be paid to striking a balance between using drones to target nonstate actors threatening important nodes of interdependence and implementing punitive measures to prevent widespread drone proliferation.

Societal visions of drone proliferation suggest that anarchical and interdependent futures are not mutually exclusive. Indeed, accelerated proliferation to state actors will limit the permissiveness for great power adventurism and simultaneously raise the danger of increased use of drones against nonstate actors outside of warzones, and citizens within domestic borders. The ES draws policymakers' attention, however, to the societal impacts of these trends in context. Continued monopolization over the drone trade by predominantly Global North states will serve to exacerbate existing fissures in international society. Barring a universal lifting of restrictions, more discriminate use of armed drones might serve to demystify some of the perceived prestige that the technology has acquired.

Ultimately, it will not be the drone trade alone that determines the health of international society. Trade relationships exist within a deeply embedded and widely accepted system of global capital. This perspective, however, offers a window into the rise of China and opportunities for it to grow its influence in the Global South. In this context US policymakers may wish to continue lifting restrictions on drone exports (Stone 2021). This, of course, returns us to the paradoxes and problems raised by liberal visions and their threat to the liberal international order.

We are unlikely to get a future that reflects exactly any one of the worlds outlined above. Given the realities of international politics it seems a safe bet that policymakers will mix these alternatives in an ad hoc fashion on a case-by-case basis. The offense-defense balance, the internal contradictions inherent in liberalism, and the fissures between the haves and have-nots of international society are enduring issues in world politics. Perhaps the best we can do is make ourselves aware of the choices in front of us and the global visions they reflect.

Learning Aid: Summary of the Argument

	Anarchy	Interdependence	Society
Primary actors	States	– States – Corporations – State competitors	– States – Individuals
Preferred world order	Balance of power	An interdependent and liberal international order (legal regulative)	International society
Reason for proliferation	Acquisition of military capability; augmenting force requirements of state militaries	– *States*: Peace and order enforcement/HADR – *Corporations*: Economic endeavors/dual-use technology – *State competitors*: Non-attribution/cost-effectiveness	Prestige, status, hierarchy, and identity creation
State security calculations	A means for security maximization by state actors	A means to protect vulnerable nodes of interdependence	A means to reinforce power hierarchies
Major problems of drone proliferation	New offensive capabilities to take into account; growth in asymmetric threats	The democratization of high-tech violence; a means for state competitors to undermine domestic and international governance	Shifts in system-level power dynamics destabilize proliferation rules and practices
International effects of drone proliferation	More easily closed regional systems; less permissive environments as states can now surveil their population and border more easily; deterrence by detection; potentially stabilizing relations between states; Mitigates ability to project power	Destabilization of the liberal international order; threatens to undermine international law; internal contradictions of enforcement and protection of liberal principles	Bifurcation of international society; increased intensity in the fissures between the Global North and Global South
Strategic prescription	Deterrence by detection and denial; Integration of drones into conventional military capabilities; drone threats a policing issue. States must accept the inevitability of risk	Legal and physical intervention to disrupt exportation of drone technology; discriminate prevention; discriminate use of drones by allies and partners	Strengthening of the norms of use and proliferation; abidance to norms of use and proliferation; abstention from drone use by state actors

Seminar Questions

1. What are the potential consequences of drone proliferation for the future of international politics?
2. Do armed drones strengthen or undermine state sovereignty?
3. Who is responsible for mitigating or managing the proliferation of armed drones?
4. Do armed drones reinforce or erode the 'liberal international order'?
5. What actions could be taken around drone proliferation to promote a more stable environment?
6. Does armed drone proliferation generate common interests across international society? If not, why not?
7. What are the costs and benefits of each mitigation or counterproliferation strategy?

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